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<110> Abe, Yuki  
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<141> 2001-04-17

<150> JP 2000-116591

<151> 2000-04-18

<150> JP 2000-117458

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<211> 17

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<213> Artificial Sequence

<220>

<221> misc\_feature

<223> Description of Artificial Sequence: A mixed primer  
which has a DNA sequence deduced from the amino  
acid sequence of PKS of *Aspergillus flavus*.

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<221> modified\_base

<222> (6)..(6)



<223> i

<220>

<221> modified\_base

<222> (9)..(9)

<223> i

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<210> 4

<211> 17

<212> DNA

<213> Artificial Sequence

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<221> misc\_feature

<223> Description of Artificial Sequence: A mixed primer  
which has a DNA sequence deduced from the amino  
acid sequence of PKS of Aspergillus flavus.

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<222> (3)..(3)

<223> i

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<221> modified\_base

<222> (6)..(6)

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<221> modified\_base

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<221> modified\_base

<222> (15)..(15)

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<211> 19

<212> DNA

<213> Penicillium citrinum

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<210> 6



<211> 19

<212> DNA

<213> *Penicillium citrinum*

<400> 6

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<210> 7

<211> 18

<212> DNA

<213> *Penicillium citrinum*

<400> 7

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<210> 8

<211> 20

<212> DNA

<213> *Penicillium citrinum*

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<210> 9

<211> 20

<212> DNA

<213> *Penicillium citrinum*



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<211> 19

<212> DNA

<213> Penicillium citrinum

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<210> 11

<211> 20

<212> DNA

<213> Penicillium citrinum

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<210> 12

<211> 19

<212> DNA

<213> Penicillium citrinum

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<210> 13

<211> 21

<212> DNA

<213> *Penicillium citrinum*

<400> 13

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<210> 14

<211> 19

<212> DNA

<213> *Penicillium citrinum*

<400> 14

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<210> 15

<211> 20

<212> DNA

<213> *Penicillium citrinum*

<400> 15

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<210> 16

<211> 21



<212> DNA

<213> Penicillium citrinum

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<210> 17

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<212> DNA

<213> Penicillium citrinum

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atcaagccaa ctatccaaac gagccaattg tggtagtggg aagcggttgt cggtttccag  
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600

accgtgtatc atacttcttc gactggcatg ggccgagtat gacgatcgac acagcctgta  
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<210> 18

<211> 760

<212> DNA

<213> *Penicillium citrinum*

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120

aaccgcaacc gcaaccgcaa ccgcaaccgc aaccgcaatg gcaggctcgg cttgctctaa  
180

cacatccacg ccattgcca tagttggaat gggatgtcga tttgctggag atgcaacgag  
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480

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600

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660

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720

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<210> 19

<211> 773

<212> DNA

<213> *Penicillium citrinum*

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cagcgtctc attcttcgct ctttcttctt ttccactggg gtgcataggc cctatctgtc  
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600

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660

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<210> 20

<211> 527

<212> DNA

<213> *Penicillium citrinum*

<400> 20

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120

aaccgattag gttgctcatt cgattttgga gagactacct agctataggt accactccaa  
180

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300

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420

cgttgataaa gcagaatggg gctctttggt cgaaggaagt cgaagcttga tcaccggccc  
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<210> 21

<211> 522

<212> DNA

<213> *Penicillium citrinum*

<400> 21

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240

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420

ggtggtaacg cagtgccttat cttctggcta actgtgctct ccagcccctg gccggtaa  
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<210> 22

<211> 541

<212> DNA

<213> *Penicillium citrinum*



<400> 22

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420

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<210> 23

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<212> DNA

<213> *Penicillium citrinum*

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<210> 24

<211> 20



<212> DNA

<213> Penicillium citrinum

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<210> 25

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<212> DNA

<213> Penicillium citrinum

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<210> 26

<211> 20

<212> DNA

<213> Penicillium citrinum

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<210> 27

<211> 20

<212> DNA

<213> Penicillium citrinum



<400> 27  
gtcttttcct actatctacc  
20

<210> 28

<211> 20

<212> DNA

<213> Penicillium citrinum

<400> 28  
ctttcccagc tgctactatc  
20

<210> 29

<211> 1524

<212> DNA

<213> Penicillium citrinum

<400> 29  
aactggaaga attcgcggcc gcaggaattt tttttttttt tttttttcaa cgaaggtaga  
60

agtaattttg acaaagatac aagacgaatt cgctatttgt agatgaatat gcgtgtgtca  
120

attgaagccg aattcaggat agatttgcca tctgctctat tgccaatttc taatccatct  
180

ttatcatgaa caacactcaa accacacatc tgaattcacg gcgctgaacg atctaggcca  
240

acttcagagc cgggttcacg gagaacatag tgaggattga agaaaagtgg tctacaaagg  
300

cctgagcgtg ctcagggcca tacagcgagc tctgaagttt gacatgaatg agtgggtcct  
360

tggtagggtc atcccacatc tcgagaacga tgtcataagg agtgcgctca cgggaagcga



420

gaacactcgt cattttggca ttgccaattg agccactctc cgcttgaccc tgcttgtaat  
480

caaagacagc ctggaacaag ggggcgtgtg tctgagtctt gggttcctcg cctgaggtag  
540

ggagattcag gcctagacag tcgaggatga cgccatacgg caccgcgcgc tgttgcatgg  
600

cctcacgcac actgtccttg gtggctacaa ggtgctcgcc gaatgtcttg ctgccgacga  
660

actcatcaaa gcgcagggga agcacgttag cgaaaaagcc catcgccgaa atttcttcca  
720

tgggtggatcg gttggtttcg gcgaggccga tggttatgtc ttgctgccg gtaagacgcg  
780

ccaacaaaac gtggtaggcg gccaggtaga actgcatggg ggttgccttg tgcttgccgc  
840

tccgctcttt gattcggaag gcgaccatgg gatctaaacg agcaattgct tcatactgct  
900

gccacgtgaa tggctgtatt tgctgctgct ctgaattggc agcaggggtca ttgatcagat  
960

tcatgatggg aagcacgggt ggccgcagatg acgagacttt gctatgcatg gacttccaga  
1020

acgcgatatc gtccccatt cgccattttt ccaggttttc ccgctggttg acggctagat  
1080

cagagaattg ggtcgatggg cgctgcattt tcaccccgt gtaaactctgc ccgatctcat  
1140

tgaacagggt ttctgttggt gagccatcac caactaatct gtggtagccg attaccaaca  
1200

ggtggtcac tgtgccccag tagaaatcaa cgagtctgag agtgtcacct gtggagatgc  
1260

tatagtttgt cttctcgagt ttccggtact cttcctctgc ctccgcagcg ttgttcacct  
1320

gaacaaagtg cactctgttc tccgggttct tgagaaccac ttggacggga ccatttaa  
1380



cgctgctata gtcacgcgcca gtaacaaagc acgtacggaa gatctcgtga cggcgcaatg  
1440

aggctttcag agcccgcctc aaccggtcga ggtcaatggc acccttcacg aacatgccaa  
1500

tagtggtggt gaagatggta tgat  
1524

<210> 30

<211> 784

<212> DNA

<213> *Penicillium citrinum*

<400> 30

aactggaaga attcgcggcc gcaggaattt tttttttttt tttttttttc tttggtgctt  
60

ctcagggcca ctgtaatggc atttcaggta tctctattta ctgctatcca gaagtcaggc  
120

attaaatagt caggctcagc ccaggctcga ttcagattgg attcaggctt cagaccatgg  
180

ccgctatgct ccttcgtact atacctccgt cgagctatac ccgcttggcc agacaaaagg  
240

cttcactgaa cccttcaact taactgcatt tcgccacaac taactcgacg aggccggcga  
300

tggtggtacc attcatgagc tcaaagatcg acacatcaac atggatttca gatgtgatcc  
360

agtttcgaag ttcaatggcg acgagtgagt ctacgccgac acctgccagg tttttggacg  
420

aggacatgac gtcttctgcc agaccaaaca ttcgcatcag cttttccgac attgctttga  
480

ggacgataga aatggcctcg tcgtgagagg tgaccctgct tagttggggc cgcacgccat  
540

ctggtccttt tttatgcgaa gagacaaagg attgggtctgc atgaaggact tggcggtatt  
600



taagtccac aaaccgctgt tcctgtatcc agtttgcctc ggtccagtga gcacccgggg  
660

atgtgttgat tcctgtaacc acagctgcgg gaggtgatgg aaattgaggg gaagaacaca  
720

ggattgcctt ctccaacaca tccatgacgt ccttttcatg cataggcttg taacctattc  
780

tagc  
784

<210> 31

<211> 764

<212> DNA

<213> *Penicillium citrinum*

<400> 31  
aactggaaga attcgcggcc gcaggaattt tttttttttt tttttttttc gaataaaatg  
60

cgttttatatt tactaaccta ctcgactaat acagcaccta gtttctctgg gacggaaacc  
120

attggaataa gcctggggac ggatgcatat ttgttttagt ttgcgtgtta tatcttagca  
180

ccggtcatga gggagcggga tgtcctcgtt gcgccggcgt accatgagct ttgtggttgg  
240

atgcatacga acgctaaaag cgtgacggta gtatttgtca tcgtctcctg gtacaggctt  
300

cacatcatat tgaatcagta tatgagcgag gagaatcttg atttccttcg aggcgaagaa  
360

ccgcccggga caagcgcgtg gggtccagcc gaagccgatg tgatcaccgt tggatttctc  
420

caattgagcg gtgaaggcct tgtctggatc ctcgcgcatg cgcataaatc ggtaggggatc  
480

ataattttcg gggttttccc acacatcagg gttgttcatg cggctctgcag ccacagcggc  
540



caactcgccc ttgggaatga agaggccatt ggatagagtg atgtctctga gagcgggtact  
600

gcgcatagtg gcgcactcga ccggcttgat tcgctgcgtc tctttcatgc agctgtcgag  
660

gagcttcagc ttgaacagag aggcaggcgt ccagccccct tctccgatta cagtgcggat  
720

ctcttggcgg agaggctgaa taaggctctgg gtgcctggca atgt  
764

<210> 32

<211> 765

<212> DNA

<213> *Penicillium citrinum*

<400> 32

aactggaaga attcgcggcc gcaggaattt tttttttttt ttttttctgg aaaaggacca  
60

tctctttata tattcttctt ccctactact tgcatacgtaa atttcaacaa catataaaca  
120

tgagataccc tttctggccg ttcactctac cacctgcctg tctcattgca ttgtgctttt  
180

gaaaattatg acaataacaa ccaatgagaa aaaatatgat cctcctgcaa tgaatccact  
240

ggagggggta cggagcttgg aatgctccta agattccgac ctaatcagcg tcgagcccga  
300

tcagtagctg cagcactcgg cctcagtgca ttgttaggaa cagggactgt cctgggttccg  
360

cctgacgggg agacacttcg agaaggggct gaagatgccg gggcagaacg gttgtgcgcc  
420

atgtgcgcct tgaccaggtg accggcggct agggcagcac atagcgagag ctccccagcc  
480

aaaacagcgc ttccgatgat gcgcgcaagt tgacgtgcat tctcaccggg agtggtcggg  
540



tgtgatccgc ggacaccaag catgtcaagc attgcgccct ggggctccag aatcgtagca  
600

ccgcccacacg ttccaacctc aatagacggc atggagacag agatttgaag cgatccgcga  
660

agattgttca tgagagtgat gcagttagcg ctctccacaa cttgcgccgg atcctgacct  
720

gtggcaatga aaatggctgc cgcaagattg gcagcttggg cgttg  
765

<210> 33

<211> 802

<212> DNA

<213> *Penicillium citrinum*

<400> 33

aactggaaga attcgcggcc gcaggaattt tttttttttt tttttataga atctttgaaa  
60

tcgacattaa ttaagtatgt ggagattctt tgtggaggca cggtaatgtg tctatctagc  
120

aacgcggtca agcatcagtc tcaggcacag cccgggtgtc gtttttggtt gcaatcttcc  
180

gccatcccat tccaaaggca aacacaaacg tgcacgccgt agctcccact gctaagtaaa  
240

aagtatgatc aacggcgaga ctgtaagctt ttacaacccc tggaagggtta ttcttgctga  
300

ccacatctct gaagccagtc gccctgctg ccgtcacggc ctgcgtgtcg acagtgggcg  
360

catacttgct caggccagtt ctcaaaccgg acccaaagac aaggttagca aagtccagga  
420

agagcgatcc tccaaacgtc tgtccaaaca cggcgagaga aattccgagg gcaccttggt  
480

cgggcgaaag cgtgctttgg atggcgatga taggcgtttg catgccacaa ccacgaccga  
540



agcccgcgat aaattggtac atgacccatt tcacagttga tgtatggggc tggaaggtgg  
600

ataccagacc tgcgcctatg gcgacgagaa cagcgctgcc tagggcccaa ggcaaatagt  
660

atcctgtctt tccaattgcg aagccagaaa ccatagccat aatgacttgt ccaagaattc  
720

caggcaacat gtacacacca ctcagtgtgg gagaaacatc cttcacagcc tggaagtaga  
780

tcggtagata gtaggaaaag ac  
802

<210> 34

<211> 562

<212> DNA

<213> *Penicillium citrinum*

<400> 34

aactggaaga attcgcggcc gcaggaattt tttttttttt ttttttttac taagcaatat  
60

tgtgtttctt cgctaattgcg aatatttcct tatagcaacg tcgcaacaca tttatcgtct  
120

tccttgaggc ctttgttgac ttgggctctt cgtctccggc ttcgtcactc caaagcacag  
180

ataggagacg agaggccggc gttatggttt tatttttcagc gccaaaggatt tgccacgatg  
240

tgcttggcat atctgatagg actagacgaa tagatgccgc agccccgtgc tcctgtgcta  
300

tccccaagc agtctcaatc cactcaata gtcgaaggct tacacgcaat gtcgtgcatg  
360

cagaagataa ggcgtgcatg aatgggtcga gatgtgaaat gagctcgccg atatgaagat  
420

tagagtgaat cgaggggaagt gcttcggctc ttccattgtc atttctagtg gttgagccag  
480



accagtagca atccattcgt gtgctttgct tttgtccaca aggttgggct ttcatacct  
540

cggatagtag cagctgggaa ag  
562

<210> 35

<211> 26

<212> DNA

<213> *Penicillium citrinum*

<400> 35  
gttaacatgt cagaacctct accccc  
26

<210> 36

<211> 27

<212> DNA

<213> *Penicillium citrinum*

<400> 36  
aatatttcaa gcatcagtct caggcac  
27

<210> 37

<211> 1662

<212> DNA

<213> *Penicillium citrinum*

<220>

<221> CDS



<222> (1)..(1662)

<400> 37

atg tca gaa cct cta ccc cct aaa gaa ggg gaa cca agg cca cag aag

48

Met Ser Glu Pro Leu Pro Pro Lys Glu Gly Glu Pro Arg Pro Gln Lys

1

5

10

15

gaa gaa agt caa aat gac acg ctc gaa gcg act gag tcc aag tcc cag

96

Glu Glu Ser Gln Asn Asp Thr Leu Glu Ala Thr Glu Ser Lys Ser Gln

20

25

30

cac atc aca ggc ctc aag ctc ggg ctg gtg gtt gct tca gtt act ttc

144

His Ile Thr Gly Leu Lys Leu Gly Leu Val Val Ala Ser Val Thr Phe

35

40

45

gta gca ttt ttg atg ctc ctt gat atg tcc att atc gtc acg gca atc

192

Val Ala Phe Leu Met Leu Leu Asp Met Ser Ile Ile Val Thr Ala Ile

50

55

60

cca cat atc aca agc gag ttc cac tct ctg aac gat gta ggg tgg tac

240

Pro His Ile Thr Ser Glu Phe His Ser Leu Asn Asp Val Gly Trp Tyr

65

70

75

80

ggc agt gct tat ctt ctg gct aac tgt gct ctc cag ccc ctg gcc ggt

288

Gly Ser Ala Tyr Leu Leu Ala Asn Cys Ala Leu Gln Pro Leu Ala Gly

85

90

95

aaa ttg tat aca ctc ttg ggc ttg aag tac act ttc ttt gcc ttc ctc

336

Lys Leu Tyr Thr Leu Leu Gly Leu Lys Tyr Thr Phe Phe Ala Phe Leu



100	105	110
tgt att ttt gaa cta ggc tcg gtg cta tgc ggt gcc gca aga tct tcc		
384		
Cys Ile Phe Glu Leu Gly Ser Val Leu Cys Gly Ala Ala Arg Ser Ser		
115	120	125
acc atg ttg att gtt ggg cgg gcc gtt gct gga atg gga ggc tca ggt		
432		
Thr Met Leu Ile Val Gly Arg Ala Val Ala Gly Met Gly Gly Ser Gly		
130	135	140
ctt gtc aac gga gcc ctc aca atc ctc tca aca gct gct cct aag cac		
480		
Leu Val Asn Gly Ala Leu Thr Ile Leu Ser Thr Ala Ala Pro Lys His		
145	150	155
aag caa cca gtt ttg att gga gtg atg atg ggt ctt agt cag att gcc		
528		
Lys Gln Pro Val Leu Ile Gly Val Met Met Gly Leu Ser Gln Ile Ala		
165	170	175
att gtc tgt gga cca ctg ctc gga ggt gct ttc act caa cac gcc act		
576		
Ile Val Cys Gly Pro Leu Leu Gly Gly Ala Phe Thr Gln His Ala Thr		
180	185	190
tgg cga tgg tgc ttt tat atc aat ctc ccc atc ggc gct gtc gct gca		
624		
Trp Arg Trp Cys Phe Tyr Ile Asn Leu Pro Ile Gly Ala Val Ala Ala		
195	200	205
ttc ctc ctt ctc gtc atc acc ata ccc gac cga att tca tcc acg gac		
672		
Phe Leu Leu Leu Val Ile Thr Ile Pro Asp Arg Ile Ser Ser Thr Asp		



210	215	220	
agc gaa ctc tcg acc gac aaa cca atg gcc aac ata aaa tcc aca ctt			
720			
Ser Glu Leu Ser Thr Asp Lys Pro Met Ala Asn Ile Lys Ser Thr Leu			
225	230	235	240
cgc aaa ctg gac ctt gta ggc ttt gtg gtc ttt gca gcc ttc gca acc			
768			
Arg Lys Leu Asp Leu Val Gly Phe Val Val Phe Ala Ala Phe Ala Thr			
	245	250	255
atg att tcc ctc gca cta gaa tgg gga ggg tcg acc tac acc tgg cga			
816			
Met Ile Ser Leu Ala Leu Glu Trp Gly Gly Ser Thr Tyr Thr Trp Arg			
	260	265	270
agt tcc gtc atc atc ggc ctg ttc tgt ggc gga ggg ttt gct ctg att			
864			
Ser Ser Val Ile Ile Gly Leu Phe Cys Gly Gly Gly Phe Ala Leu Ile			
	275	280	285
gcg ttc gtg cta tgg gag cgt cat gtt ggc gat gct gtt gcc atg att			
912			
Ala Phe Val Leu Trp Glu Arg His Val Gly Asp Ala Val Ala Met Ile			
290	295	300	
cct ggc tca gtg gct ggt aaa cga caa gtg tgg tgc tct tgt tta ttt			
960			
Pro Gly Ser Val Ala Gly Lys Arg Gln Val Trp Cys Ser Cys Leu Phe			
305	310	315	320
atg ggc ttt ttc tct ggc tcc ttg ctt gtc ttt tcc tac tat cta ccg			
1008			
Met Gly Phe Phe Ser Gly Ser Leu Leu Val Phe Ser Tyr Tyr Leu Pro			
	325	330	335



atc tac ttc cag gct gtg aag gat gtt tct ccc aca ctg agt ggt gtg  
1056

Ile Tyr Phe Gln Ala Val Lys Asp Val Ser Pro Thr Leu Ser Gly Val

340

345

350

tac atg ttg cct gga att ctt gga caa gtc att atg gct atg gtt tct  
1104

Tyr Met Leu Pro Gly Ile Leu Gly Gln Val Ile Met Ala Met Val Ser

355

360

365

ggc ttc gca att gga aag aca gga tac tat ttg cct tgg gcc cta ggc  
1152

Gly Phe Ala Ile Gly Lys Thr Gly Tyr Tyr Leu Pro Trp Ala Leu Gly

370

375

380

agc gct gtt ctc gtc gcc ata ggc gca ggt ctg gta tcc acc ttc cag  
1200

Ser Ala Val Leu Val Ala Ile Gly Ala Gly Leu Val Ser Thr Phe Gln

385

390

395

400

ccc cat aca tca act gtg aaa tgg gtc atg tac caa ttt atc gcg ggc  
1248

Pro His Thr Ser Thr Val Lys Trp Val Met Tyr Gln Phe Ile Ala Gly

405

410

415

ttc ggt cgt ggt tgt ggc atg caa acg cct atc atc gcc atc caa agc  
1296

Phe Gly Arg Gly Cys Gly Met Gln Thr Pro Ile Ile Ala Ile Gln Ser

420

425

430

acg ctt tcg ccc gaa caa ggt gcc ctc gga att tct ctc gcc gtg ttt  
1344

Thr Leu Ser Pro Glu Gln Gly Ala Leu Gly Ile Ser Leu Ala Val Phe

435

440

445



gga cag acg ttt gga gga tcg ctc ttc ctg gac ttt gct aac ctt gtc  
1392

Gly Gln Thr Phe Gly Gly Ser Leu Phe Leu Asp Phe Ala Asn Leu Val

450

455

460

ttt ggg tcc ggt ttg aga act ggc ctg agc aag tat gcg ccc act gtc  
1440

Phe Gly Ser Gly Leu Arg Thr Gly Leu Ser Lys Tyr Ala Pro Thr Val

465

470

475

480

gac acg cag gcc gtg acg gca gca ggg gcg act ggc ttc aga gat gtg  
1488

Asp Thr Gln Ala Val Thr Ala Ala Gly Ala Thr Gly Phe Arg Asp Val

485

490

495

gtc agc aag aat aac ctt cca ggg gtt gta aaa gct tac agt ctc gcc  
1536

Val Ser Lys Asn Asn Leu Pro Gly Val Val Lys Ala Tyr Ser Leu Ala

500

505

510

gtt gat cat act ttt tac tta gca gtg gga gct acg gcg tgc acg ttt  
1584

Val Asp His Thr Phe Tyr Leu Ala Val Gly Ala Thr Ala Cys Thr Phe

515

520

525

gtg ttt gcc ttt gga atg gga tgg cgg aag att gca acc aaa aac gac  
1632

Val Phe Ala Phe Gly Met Gly Trp Arg Lys Ile Ala Thr Lys Asn Asp

530

535

540

acc cgg gct gtg cct gag act gat gct tga  
1662

Thr Arg Ala Val Pro Glu Thr Asp Ala

545

550



<210> 38

<211> 553

<212> PRT

<213> Penicillium citrinum

<400> 38

Met	Ser	Glu	Pro	Leu	Pro	Pro	Lys	Glu	Gly	Glu	Pro	Arg	Pro	Gln	Lys
1				5					10					15	

Glu	Glu	Ser	Gln	Asn	Asp	Thr	Leu	Glu	Ala	Thr	Glu	Ser	Lys	Ser	Gln
			20					25					30		

His	Ile	Thr	Gly	Leu	Lys	Leu	Gly	Leu	Val	Val	Ala	Ser	Val	Thr	Phe
		35					40					45			

Val	Ala	Phe	Leu	Met	Leu	Leu	Asp	Met	Ser	Ile	Ile	Val	Thr	Ala	Ile
	50					55					60				

Pro	His	Ile	Thr	Ser	Glu	Phe	His	Ser	Leu	Asn	Asp	Val	Gly	Trp	Tyr
65					70					75					80

Gly	Ser	Ala	Tyr	Leu	Leu	Ala	Asn	Cys	Ala	Leu	Gln	Pro	Leu	Ala	Gly
				85					90					95	

Lys	Leu	Tyr	Thr	Leu	Leu	Gly	Leu	Lys	Tyr	Thr	Phe	Phe	Ala	Phe	Leu
			100					105					110		

Cys	Ile	Phe	Glu	Leu	Gly	Ser	Val	Leu	Cys	Gly	Ala	Ala	Arg	Ser	Ser
		115					120					125			

Thr	Met	Leu	Ile	Val	Gly	Arg	Ala	Val	Ala	Gly	Met	Gly	Gly	Ser	Gly
	130					135					140				

Leu	Val	Asn	Gly	Ala	Leu	Thr	Ile	Leu	Ser	Thr	Ala	Ala	Pro	Lys	His
145					150					155					160



Lys Gln Pro Val Leu Ile Gly Val Met Met Gly Leu Ser Gln Ile Ala  
165 170 175

Ile Val Cys Gly Pro Leu Leu Gly Gly Ala Phe Thr Gln His Ala Thr  
180 185 190

Trp Arg Trp Cys Phe Tyr Ile Asn Leu Pro Ile Gly Ala Val Ala Ala  
195 200 205

Phe Leu Leu Leu Val Ile Thr Ile Pro Asp Arg Ile Ser Ser Thr Asp  
210 215 220

Ser Glu Leu Ser Thr Asp Lys Pro Met Ala Asn Ile Lys Ser Thr Leu  
225 230 235 240

Arg Lys Leu Asp Leu Val Gly Phe Val Val Phe Ala Ala Phe Ala Thr  
245 250 255

Met Ile Ser Leu Ala Leu Glu Trp Gly Gly Ser Thr Tyr Thr Trp Arg  
260 265 270

Ser Ser Val Ile Ile Gly Leu Phe Cys Gly Gly Gly Phe Ala Leu Ile  
275 280 285

Ala Phe Val Leu Trp Glu Arg His Val Gly Asp Ala Val Ala Met Ile  
290 295 300

Pro Gly Ser Val Ala Gly Lys Arg Gln Val Trp Cys Ser Cys Leu Phe  
305 310 315 320

Met Gly Phe Phe Ser Gly Ser Leu Leu Val Phe Ser Tyr Tyr Leu Pro  
325 330 335

Ile Tyr Phe Gln Ala Val Lys Asp Val Ser Pro Thr Leu Ser Gly Val  
340 345 350

Tyr Met Leu Pro Gly Ile Leu Gly Gln Val Ile Met Ala Met Val Ser



		355				360						365				
Gly 370	Phe	Ala	Ile	Gly	Lys	Thr 375	Gly	Tyr	Tyr	Leu	Pro 380	Trp	Ala	Leu	Gly	
Ser 385	Ala	Val	Leu	Val	Ala 390	Ile	Gly	Ala	Gly	Leu 395	Val	Ser	Thr	Phe	Gln 400	
Pro	His	Thr	Ser	Thr 405	Val	Lys	Trp	Val	Met 410	Tyr	Gln	Phe	Ile	Ala 415	Gly	
Phe	Gly	Arg	Gly 420	Cys	Gly	Met	Gln	Thr 425	Pro	Ile	Ile	Ala	Ile 430	Gln	Ser	
Thr	Leu	Ser 435	Pro	Glu	Gln	Gly	Ala 440	Leu	Gly	Ile	Ser	Leu 445	Ala	Val	Phe	
Gly 450	Gln	Thr	Phe	Gly	Gly	Ser 455	Leu	Phe	Leu	Asp	Phe 460	Ala	Asn	Leu	Val	
Phe 465	Gly	Ser	Gly	Leu	Arg 470	Thr	Gly	Leu	Ser	Lys 475	Tyr	Ala	Pro	Thr	Val 480	
Asp	Thr	Gln	Ala	Val 485	Thr	Ala	Ala	Gly	Ala 490	Thr	Gly	Phe	Arg	Asp 495	Val	
Val	Ser	Lys	Asn 500	Asn	Leu	Pro	Gly	Val 505	Val	Lys	Ala	Tyr	Ser 510	Leu	Ala	
Val	Asp	His 515	Thr	Phe	Tyr	Leu	Ala 520	Val	Gly	Ala	Thr	Ala 525	Cys	Thr	Phe	
Val 530	Phe	Ala	Phe	Gly	Met	Gly 535	Trp	Arg	Lys	Ile	Ala 540	Thr	Lys	Asn	Asp	
Thr 545	Arg	Ala	Val	Pro	Glu 550	Thr	Asp	Ala								



<210> 39

<211> 31

<212> DNA

<213> *Penicillium citrinum*

<400> 39

ggatccatgt ccctgccgca tgcaacgatt c  
31

<210> 40

<211> 30

<212> DNA

<213> *Penicillium citrinum*

<400> 40

ggatccctaa gcaatattgt gtttcttcgc  
30

<210> 41

<211> 1380

<212> DNA

<213> *Penicillium citrinum*

<220>

<221> CDS

<222> (1)..(1380)

<400> 41

atg tcc ctg ccg cat gca acg att ccg acg aac cta cgc cgt cgc gcg



48  
Met Ser Leu Pro His Ala Thr Ile Pro Thr Asn Leu Arg Arg Arg Ala  
1 5 10 15

ttt cga cgc tca tgt gac cgg tgt cat gca caa aag ctc aaa tgt acc  
96  
Phe Arg Arg Ser Cys Asp Arg Cys His Ala Gln Lys Leu Lys Cys Thr  
20 25 30

ggt agc aat gcc aat tta gtc cgt gct cag tgt caa cgt tgt caa caa  
144  
Gly Ser Asn Ala Asn Leu Val Arg Ala Gln Cys Gln Arg Cys Gln Gln  
35 40 45

gcc gga tta agg tgt gtg tac agc gaa agg cta ccc aag cgc aat tta  
192  
Ala Gly Leu Arg Cys Val Tyr Ser Glu Arg Leu Pro Lys Arg Asn Leu  
50 55 60

cat aaa gaa gcc gca gct gga act aca aga gcc aca gaa acc tca caa  
240  
His Lys Glu Ala Ala Ala Gly Thr Thr Arg Ala Thr Glu Thr Ser Gln  
65 70 75 80

ccg atg acc gcg aca tct tct acg gtc ttc tca tca ttg gca gag act  
288  
Pro Met Thr Ala Thr Ser Ser Thr Val Phe Ser Ser Leu Ala Glu Thr  
85 90 95

cct cca cct tac tgc tca cca cct acg cat att ggc acc tcg gca ctc  
336  
Pro Pro Pro Tyr Cys Ser Pro Pro Thr His Ile Gly Thr Ser Ala Leu  
100 105 110

aag gaa aca tta tca gaa cca tca gcg gca acc ctg caa ttc tat gat  
384



Lys Glu Thr Leu Ser Glu Pro Ser Ala Ala Thr Leu Gln Phe Tyr Asp

115

120

125

aca tca atc aac ttt gat gat ccc gag tcg ttt ccc ggc ggc tgg cct  
432

Thr Ser Ile Asn Phe Asp Asp Pro Glu Ser Phe Pro Gly Gly Trp Pro

130

135

140

cag cca aat aca ttt cgc gac gat gcc aac agc aat gaa tct tcg ggg  
480

Gln Pro Asn Thr Phe Arg Asp Asp Ala Asn Ser Asn Glu Ser Ser Gly

145

150

155

160

ata cca gat cta ggc tac gac ttt gaa ggc cct ttg gat gca acg gcg  
528

Ile Pro Asp Leu Gly Tyr Asp Phe Glu Gly Pro Leu Asp Ala Thr Ala

165

170

175

cct gtc tcg cca tcg ctg ttt gac ctc gaa gta gag ggg aac tcg tca  
576

Pro Val Ser Pro Ser Leu Phe Asp Leu Glu Val Glu Gly Asn Ser Ser

180

185

190

tcc gga caa tcc aac aca agc aac acg caa cga gac ctt ttc gaa agt  
624

Ser Gly Gln Ser Asn Thr Ser Asn Thr Gln Arg Asp Leu Phe Glu Ser

195

200

205

ctg tcg gat gtg tca cag gac cta gag gta ata ctc cac ggg gtg act  
672

Leu Ser Asp Val Ser Gln Asp Leu Glu Val Ile Leu His Gly Val Thr

210

215

220

gtg gaa tgg ccc aag caa aaa att tta agc tac ccg ata ggg gac ttt  
720

Val Glu Trp Pro Lys Gln Lys Ile Leu Ser Tyr Pro Ile Gly Asp Phe



225 230 235 240

ttg aat gcc ttt ggt aga ttg cta cta cat ctt caa gaa cgt gtg atc  
768

Leu Asn Ala Phe Gly Arg Leu Leu Leu His Leu Gln Glu Arg Val Ile

245 250 255

acg agc agc aat agc agc atg tta gat ggg tgt ctg caa acc aag aac  
816

Thr Ser Ser Asn Ser Ser Met Leu Asp Gly Cys Leu Gln Thr Lys Asn

260 265 270

ttg ttc atg gcg gtg cat tgc tac atg ttg tct gtc aaa atc atg aca  
864

Leu Phe Met Ala Val His Cys Tyr Met Leu Ser Val Lys Ile Met Thr

275 280 285

tca ctt tcc cag ctg cta cta tcc gag gtg atg aaa gcc caa cct tgt  
912

Ser Leu Ser Gln Leu Leu Leu Ser Glu Val Met Lys Ala Gln Pro Cys

290 295 300

gga caa aag caa agc aca cga atg gat tgg tac tgg tct ggc tca acc  
960

Gly Gln Lys Gln Ser Thr Arg Met Asp Trp Tyr Trp Ser Gly Ser Thr

305 310 315 320

act aga aat gac aat gga aga gcc gaa gca ctt ccc tcg ttt cac tct  
1008

Thr Arg Asn Asp Asn Gly Arg Ala Glu Ala Leu Pro Ser Phe His Ser

325 330 335

aat ctt cat atc ggc gag ctc att tca cat ctc gac cca ttc atg cac  
1056

Asn Leu His Ile Gly Glu Leu Ile Ser His Leu Asp Pro Phe Met His



340	345	350
gcc tta tct tct gca tgc acg aca ttg cgt gta agc ctt cga cta ttg		
1104		
Ala Leu Ser Ser Ala Cys Thr Thr Leu Arg Val Ser Leu Arg Leu Leu		
355	360	365
agt gag att gag act gct ttg ggg ata gca cag gag cac ggg gct gcg		
1152		
Ser Glu Ile Glu Thr Ala Leu Gly Ile Ala Gln Glu His Gly Ala Ala		
370	375	380
gca tct att cgt cta gtc cta tca gat atg cca agc aca tcg tgg caa		
1200		
Ala Ser Ile Arg Leu Val Leu Ser Asp Met Pro Ser Thr Ser Trp Gln		
385	390	395
atc ctt ggc gct gaa aat aaa acc ata acg ccg gcc tct cgt ctc cta		
1248		
Ile Leu Gly Ala Glu Asn Lys Thr Ile Thr Pro Ala Ser Arg Leu Leu		
405	410	415
tct gtg ctt tgg agt gac gaa gcc gga gac gaa gag ccc aag tca aca		
1296		
Ser Val Leu Trp Ser Asp Glu Ala Gly Asp Glu Glu Pro Lys Ser Thr		
420	425	430
aag gcc tca ggg aag acg ata aat gtg ttg cga cgt tgc tat aag gaa		
1344		
Lys Ala Ser Gly Lys Thr Ile Asn Val Leu Arg Arg Cys Tyr Lys Glu		
435	440	445
ata ttc gca tta gcg aag aaa cac aat att gct tag		
1380		
Ile Phe Ala Leu Ala Lys Lys His Asn Ile Ala		
450	455	



<210> 42

<211> 459

<212> PRT

<213> Penicillium citrinum

<400> 42

Met Ser Leu Pro His Ala Thr Ile Pro Thr Asn Leu Arg Arg Arg Ala  
1 5 10 15

Phe Arg Arg Ser Cys Asp Arg Cys His Ala Gln Lys Leu Lys Cys Thr  
20 25 30

Gly Ser Asn Ala Asn Leu Val Arg Ala Gln Cys Gln Arg Cys Gln Gln  
35 40 45

Ala Gly Leu Arg Cys Val Tyr Ser Glu Arg Leu Pro Lys Arg Asn Leu  
50 55 60

His Lys Glu Ala Ala Ala Gly Thr Thr Arg Ala Thr Glu Thr Ser Gln  
65 70 75 80

Pro Met Thr Ala Thr Ser Ser Thr Val Phe Ser Ser Leu Ala Glu Thr  
85 90 95

Pro Pro Pro Tyr Cys Ser Pro Pro Thr His Ile Gly Thr Ser Ala Leu  
100 105 110

Lys Glu Thr Leu Ser Glu Pro Ser Ala Ala Thr Leu Gln Phe Tyr Asp  
115 120 125

Thr Ser Ile Asn Phe Asp Asp Pro Glu Ser Phe Pro Gly Gly Trp Pro  
130 135 140



Gln Pro Asn Thr Phe Arg Asp Asp Ala Asn Ser Asn Glu Ser Ser Gly  
145 150 155 160

Ile Pro Asp Leu Gly Tyr Asp Phe Glu Gly Pro Leu Asp Ala Thr Ala  
165 170 175

Pro Val Ser Pro Ser Leu Phe Asp Leu Glu Val Glu Gly Asn Ser Ser  
180 185 190

Ser Gly Gln Ser Asn Thr Ser Asn Thr Gln Arg Asp Leu Phe Glu Ser  
195 200 205

Leu Ser Asp Val Ser Gln Asp Leu Glu Val Ile Leu His Gly Val Thr  
210 215 220

Val Glu Trp Pro Lys Gln Lys Ile Leu Ser Tyr Pro Ile Gly Asp Phe  
225 230 235 240

Leu Asn Ala Phe Gly Arg Leu Leu Leu His Leu Gln Glu Arg Val Ile  
245 250 255

Thr Ser Ser Asn Ser Ser Met Leu Asp Gly Cys Leu Gln Thr Lys Asn  
260 265 270

Leu Phe Met Ala Val His Cys Tyr Met Leu Ser Val Lys Ile Met Thr  
275 280 285

Ser Leu Ser Gln Leu Leu Leu Ser Glu Val Met Lys Ala Gln Pro Cys  
290 295 300

Gly Gln Lys Gln Ser Thr Arg Met Asp Trp Tyr Trp Ser Gly Ser Thr  
305 310 315 320

Thr Arg Asn Asp Asn Gly Arg Ala Glu Ala Leu Pro Ser Phe His Ser  
325 330 335

Asn Leu His Ile Gly Glu Leu Ile Ser His Leu Asp Pro Phe Met His  
340 345 350



Ala Leu Ser Ser Ala Cys Thr Thr Leu Arg Val Ser Leu Arg Leu Leu  
355 360 365

Ser Glu Ile Glu Thr Ala Leu Gly Ile Ala Gln Glu His Gly Ala Ala  
370 375 380

Ala Ser Ile Arg Leu Val Leu Ser Asp Met Pro Ser Thr Ser Trp Gln  
385 390 395 400

Ile Leu Gly Ala Glu Asn Lys Thr Ile Thr Pro Ala Ser Arg Leu Leu  
405 410 415

Ser Val Leu Trp Ser Asp Glu Ala Gly Asp Glu Glu Pro Lys Ser Thr  
420 425 430

Lys Ala Ser Gly Lys Thr Ile Asn Val Leu Arg Arg Cys Tyr Lys Glu  
435 440 445

Ile Phe Ala Leu Ala Lys Lys His Asn Ile Ala  
450 455

<210> 43

<211> 9099

<212> DNA

<213> Penicillium citrinum

<220>

<221> CDS

<222> (1)..(9099)

<400> 43

atg gat caa gcc aac tat cca aac gag cca att gtg gta gtg gga agc  
48



Met Asp Gln Ala Asn Tyr Pro Asn Glu Pro Ile Val Val Val Gly Ser  
1 5 10 15

ggt tgt cgg ttt cca ggt ggt gtc aac aca cca tca aaa ctt tgg gag  
96  
Gly Cys Arg Phe Pro Gly Gly Val Asn Thr Pro Ser Lys Leu Trp Glu  
20 25 30

ctg ctc aaa gag ccc cgg gat gta cag acc aag atc cct aag gag aga  
144  
Leu Leu Lys Glu Pro Arg Asp Val Gln Thr Lys Ile Pro Lys Glu Arg  
35 40 45

ttt gac gtc gat aca ttt tac agc ccc gat ggc act cac ccc ggg cgc  
192  
Phe Asp Val Asp Thr Phe Tyr Ser Pro Asp Gly Thr His Pro Gly Arg  
50 55 60

acg aac gca ccc ttt gca tac ttg ctg cag gag gat cta cgc ggt ttt  
240  
Thr Asn Ala Pro Phe Ala Tyr Leu Leu Gln Glu Asp Leu Arg Gly Phe  
65 70 75 80

gat gcc tct ttc ttc aac atc caa gct gga gag gcc gaa acg att gac  
288  
Asp Ala Ser Phe Phe Asn Ile Gln Ala Gly Glu Ala Glu Thr Ile Asp  
85 90 95

cca cag caa agg ctg ctg ctg gag acg gtc tat gaa gct gta tcc aac  
336  
Pro Gln Gln Arg Leu Leu Leu Glu Thr Val Tyr Glu Ala Val Ser Asn  
100 105 110

gca ggc cta cgg atc caa ggc ctt caa gga tcc tct act gct gtg tac  
384  
Ala Gly Leu Arg Ile Gln Gly Leu Gln Gly Ser Ser Thr Ala Val Tyr



115	120	125
gtc ggt atg atg acg cat gac tat gag act atc gtg acg cgt gaa ttg		
432		
Val Gly Met Met Thr His Asp Tyr Glu Thr Ile Val Thr Arg Glu Leu		
130	135	140
gat agt att cct aca tac tct gcc acg ggg gta gct gtc agt gtg gcc		
480		
Asp Ser Ile Pro Thr Tyr Ser Ala Thr Gly Val Ala Val Ser Val Ala		
145	150	155
tcc aac cgt gta tca tac ttc ttc gac tgg cat ggg ccg agt atg acg		
528		
Ser Asn Arg Val Ser Tyr Phe Phe Asp Trp His Gly Pro Ser Met Thr		
165	170	175
atc gac aca gcc tgt agt tca tcc tta gct gcc gtg cat ctg gcc gtc		
576		
Ile Asp Thr Ala Cys Ser Ser Ser Leu Ala Ala Val His Leu Ala Val		
180	185	190
caa cag ctt aga acg ggc gag agt acc atg gcg gtt gca gcc ggt gcg		
624		
Gln Gln Leu Arg Thr Gly Glu Ser Thr Met Ala Val Ala Ala Gly Ala		
195	200	205
aat ctg ata ttg ggc ccc atg acc ttt gta atg gag agc aaa ttg aac		
672		
Asn Leu Ile Leu Gly Pro Met Thr Phe Val Met Glu Ser Lys Leu Asn		
210	215	220
atg ctg tcc ccc aat ggt aga tct cga atg tgg gat gct gct gcc gat		
720		
Met Leu Ser Pro Asn Gly Arg Ser Arg Met Trp Asp Ala Ala Ala Asp		



225	230	235	240
gga tat gcc aga gga gaa ggt gtt tgc tct att gtc ctg aaa acg ctg			
768			
Gly Tyr Ala Arg Gly Glu Gly Val Cys Ser Ile Val Leu Lys Thr Leu			
	245	250	255
agc cag gca ctg cgc gac ggg gac agt atc gag tgt gtt atc cga gag			
816			
Ser Gln Ala Leu Arg Asp Gly Asp Ser Ile Glu Cys Val Ile Arg Glu			
	260	265	270
acc ggt atc aac caa gat ggc cga acg aca ggt atc aca atg cca aac			
864			
Thr Gly Ile Asn Gln Asp Gly Arg Thr Thr Gly Ile Thr Met Pro Asn			
	275	280	285
cat agc gca caa gaa gcc ctc att cgg gcc aca tat gcc aag gct ggt			
912			
His Ser Ala Gln Glu Ala Leu Ile Arg Ala Thr Tyr Ala Lys Ala Gly			
	290	295	300
ctt gat att acc aac ccc cag gaa cgc tgc cag ttc ttt gaa gcc cat			
960			
Leu Asp Ile Thr Asn Pro Gln Glu Arg Cys Gln Phe Phe Glu Ala His			
305	310	315	320
gga act ggt aca cca gcc ggt gac cca cag gaa gct gag gct att gca			
1008			
Gly Thr Gly Thr Pro Ala Gly Asp Pro Gln Glu Ala Glu Ala Ile Ala			
	325	330	335
aca gcc ttc ttc gga cac aag gat gga aca atc gac agc gac ggc gag			
1056			
Thr Ala Phe Phe Gly His Lys Asp Gly Thr Ile Asp Ser Asp Gly Glu			
	340	345	350



aaa gat gag ctt ttt gtc ggc agc atc aag aca gtt ctc ggt cac acg  
1104

Lys Asp Glu Leu Phe Val Gly Ser Ile Lys Thr Val Leu Gly His Thr

355

360

365

gaa ggc act gct ggt att gcg ggc tta atg aag gca tcg ttt gct gta  
1152

Glu Gly Thr Ala Gly Ile Ala Gly Leu Met Lys Ala Ser Phe Ala Val

370

375

380

cga aat ggc gtg atc ccg cca aac ctg ctg ttt gag aag atc agt ccc  
1200

Arg Asn Gly Val Ile Pro Pro Asn Leu Leu Phe Glu Lys Ile Ser Pro

385

390

395

400

cgt gtc gct ccg ttc tat acg cac ttg aaa att gca acg gag gcc aca  
1248

Arg Val Ala Pro Phe Tyr Thr His Leu Lys Ile Ala Thr Glu Ala Thr

405

410

415

gaa tgg ccg att gtt gcg ccc ggg cag cct cgc aga gtc agc gtt aat  
1296

Glu Trp Pro Ile Val Ala Pro Gly Gln Pro Arg Arg Val Ser Val Asn

420

425

430

tca ttt gga ttt ggt ggt aca aat gcc cat gct att atc gaa gag tat  
1344

Ser Phe Gly Phe Gly Gly Thr Asn Ala His Ala Ile Ile Glu Glu Tyr

435

440

445

atg gct cct cca cac aag ccg aca gca gtg gta aca gag gtg acc tca  
1392

Met Ala Pro Pro His Lys Pro Thr Ala Val Val Thr Glu Val Thr Ser

450

455

460



gat gca gat gca tgc agc ttg ccc ctt gtg ctt tca tcg aag tcg cag  
1440  
Asp Ala Asp Ala Cys Ser Leu Pro Leu Val Leu Ser Ser Lys Ser Gln  
465 470 475 480

cgc tcc atg aag gca acg cta gaa aat atg ctc caa ttt ctg gaa acg  
1488  
Arg Ser Met Lys Ala Thr Leu Glu Asn Met Leu Gln Phe Leu Glu Thr  
485 490 495

cat gat gac gtg gac atg cat gat atc gca tat acc tta ctt gag aaa  
1536  
His Asp Asp Val Asp Met His Asp Ile Ala Tyr Thr Leu Leu Glu Lys  
500 505 510

cgg tct atc ttg ccc ttc cgt cgt gcg att gca gca cac aac aag gaa  
1584  
Arg Ser Ile Leu Pro Phe Arg Arg Ala Ile Ala Ala His Asn Lys Glu  
515 520 525

gta gcc cgc gcg gca ctg gag gct gcc atc gcg gac ggt gag gtc gtc  
1632  
Val Ala Arg Ala Ala Leu Glu Ala Ala Ile Ala Asp Gly Glu Val Val  
530 535 540

acc gac ttc cgc acc gac gcg aat gac aac cct cgc gta cta ggt gtc  
1680  
Thr Asp Phe Arg Thr Asp Ala Asn Asp Asn Pro Arg Val Leu Gly Val  
545 550 555 560

ttt act ggc caa ggt gca cag tgg ccg ggc atg ctg aag aag ctc atg  
1728  
Phe Thr Gly Gln Gly Ala Gln Trp Pro Gly Met Leu Lys Lys Leu Met  
565 570 575

gtg ggt atg cca ttt gtg aga ggc att ctc gaa gag ctg gat aat tca



1776  
Val Gly Met Pro Phe Val Arg Gly Ile Leu Glu Glu Leu Asp Asn Ser  
580 585 590

ctg caa aca ctg cct gaa aag tat cgg cct acg tgg aca ctg tat gac  
1824  
Leu Gln Thr Leu Pro Glu Lys Tyr Arg Pro Thr Trp Thr Leu Tyr Asp  
595 600 605

cag ctc atg ctt gaa ggg gat gcc tca aac gtc aga ctc gcc agc ttc  
1872  
Gln Leu Met Leu Glu Gly Asp Ala Ser Asn Val Arg Leu Ala Ser Phe  
610 615 620

tcc cag cct cta tgc tgc gcc gta caa atc gtt ctg gtc cga ctt ctc  
1920  
Ser Gln Pro Leu Cys Cys Ala Val Gln Ile Val Leu Val Arg Leu Leu  
625 630 635 640

gct gca gct ggt atc gag ttc agt gca att gtc ggc cac agt tca ggt  
1968  
Ala Ala Ala Gly Ile Glu Phe Ser Ala Ile Val Gly His Ser Ser Gly  
645 650 655

gag att gcc tgt gcc ttt gcg gca gga ttc atc agt gcc act caa gct  
2016  
Glu Ile Ala Cys Ala Phe Ala Ala Gly Phe Ile Ser Ala Thr Gln Ala  
660 665 670

atc cgt att gcg cat ctg cgt gga gtt gtg tcc gcg gag cat gcc tct  
2064  
Ile Arg Ile Ala His Leu Arg Gly Val Val Ser Ala Glu His Ala Ser  
675 680 685

tct cca agc ggc cag aca ggc gct atg cta gcg gca ggt atg tcg tac  
2112



Ser Pro Ser Gly Gln Thr Gly Ala Met Leu Ala Ala Gly Met Ser Tyr

690

695

700

gat gac gca aag gaa cta tgc gag ctc gaa gcc ttt gag ggt cgg gtc

2160

Asp Asp Ala Lys Glu Leu Cys Glu Leu Glu Ala Phe Glu Gly Arg Val

705

710

715

720

tgc gtc gcc gct agc aat tca ccg gat agt gtg acc ttc tcc ggc gac

2208

Cys Val Ala Ala Ser Asn Ser Pro Asp Ser Val Thr Phe Ser Gly Asp

725

730

735

atg gat gct atc cag cac gtt gaa ggt gtc ttg gag gat gaa tcc act

2256

Met Asp Ala Ile Gln His Val Glu Gly Val Leu Glu Asp Glu Ser Thr

740

745

750

ttt gcc aga atc ttg aga gtt gac aag gcc tac cat tcg cat cac atg

2304

Phe Ala Arg Ile Leu Arg Val Asp Lys Ala Tyr His Ser His His Met

755

760

765

cac cca tgc gca gct cca tat gtc aag gca ttg ctg gag tgc gac tgt

2352

His Pro Cys Ala Ala Pro Tyr Val Lys Ala Leu Leu Glu Cys Asp Cys

770

775

780

gct gtt gcc gat ggc caa ggt aac gat agt gtt gct tgg ttc tct gcc

2400

Ala Val Ala Asp Gly Gln Gly Asn Asp Ser Val Ala Trp Phe Ser Ala

785

790

795

800

gtc cac gag acc agc aag caa atg act gta cag gat gtg atg ccc gct

2448

Val His Glu Thr Ser Lys Gln Met Thr Val Gln Asp Val Met Pro Ala



	805	810	815
tat tgg aaa gac aat ctc gtc tct ccg gtc ttg ttc tcg cag gct gtg 2496			
Tyr Trp Lys Asp Asn Leu Val Ser Pro Val Leu Phe Ser Gln Ala Val			
	820	825	830
cag aaa gca gtc atc act cat cgt cta atc gac gtc gcc atc gaa att 2544			
Gln Lys Ala Val Ile Thr His Arg Leu Ile Asp Val Ala Ile Glu Ile			
	835	840	845
ggc gcc cac cct gct ctc aag ggt ccg tgt cta gcc acc atc aag gat 2592			
Gly Ala His Pro Ala Leu Lys Gly Pro Cys Leu Ala Thr Ile Lys Asp			
	850	855	860
gct ctt gcc ggt gtg gag ctg ccg tat acc ggg tgc ttg gca cga aac 2640			
Ala Leu Ala Gly Val Glu Leu Pro Tyr Thr Gly Cys Leu Ala Arg Asn			
865	870	875	880
gtt gac gat gtg gac gct ttt gct gga ggt ctg gga tac att tgg gag 2688			
Val Asp Asp Val Asp Ala Phe Ala Gly Gly Leu Gly Tyr Ile Trp Glu			
	885	890	895
cgt ttc gga gtt cgg agt atc gac gcc gag ggc ttc gta caa caa gtc 2736			
Arg Phe Gly Val Arg Ser Ile Asp Ala Glu Gly Phe Val Gln Gln Val			
	900	905	910
cgg ccc gat cgt gcc gtt caa aac ctg tca aag tca ttg ccc aca tac 2784			
Arg Pro Asp Arg Ala Val Gln Asn Leu Ser Lys Ser Leu Pro Thr Tyr			



915	920	925
tct tgg gat cat act cgt caa tac tgg gca gaa tct cgc tcc acc cgc		
2832		
Ser Trp Asp His Thr Arg Gln Tyr Trp Ala Glu Ser Arg Ser Thr Arg		
930	935	940
cag cat ctt cgt gga ggt gcg ccc cat ctt ctg ctt gga aag ctt tct		
2880		
Gln His Leu Arg Gly Gly Ala Pro His Leu Leu Leu Gly Lys Leu Ser		
945	950	955
tct tac agc aca gca tcg acc ttc cag tgg aca aac ttc atc agg ccc		
2928		
Ser Tyr Ser Thr Ala Ser Thr Phe Gln Trp Thr Asn Phe Ile Arg Pro		
965	970	975
cgg gat ctg gaa tgg ctc gac ggt cat gcg cta caa ggc cag act gtg		
2976		
Arg Asp Leu Glu Trp Leu Asp Gly His Ala Leu Gln Gly Gln Thr Val		
980	985	990
ttc ccc gct gct ggg tac ata att atg gcc atg gaa gct gcc atg aag		
3024		
Phe Pro Ala Ala Gly Tyr Ile Ile Met Ala Met Glu Ala Ala Met Lys		
995	1000	1005
gtg gct ggt gag cgt gcc gcc caa gtt cag ctc ctg gaa atc ttg		
3069		
Val Ala Gly Glu Arg Ala Ala Gln Val Gln Leu Leu Glu Ile Leu		
1010	1015	1020
gac atg agc atc aac aaa gcc atc gtg ttt gaa gat gaa aac acc		
3114		
Asp Met Ser Ile Asn Lys Ala Ile Val Phe Glu Asp Glu Asn Thr		
1025	1030	1035



tcc gtg gag ctg aac ttg aca gcc gaa gtc acc agt gac aat gat  
3159

Ser Val Glu Leu Asn Leu Thr Ala Glu Val Thr Ser Asp Asn Asp

1040

1045

1050

gcg gat ggc caa gtc acg gtc aaa ttt gtt att gat tcc tgt ctg  
3204

Ala Asp Gly Gln Val Thr Val Lys Phe Val Ile Asp Ser Cys Leu

1055

1060

1065

gca aag gag agt gag ctt tcg aca tcc gcc aaa ggc caa atc gtc  
3249

Ala Lys Glu Ser Glu Leu Ser Thr Ser Ala Lys Gly Gln Ile Val

1070

1075

1080

ata acc ctt ggc gag gca tca ccg tca tcg cag ctt ttg ccg cca  
3294

Ile Thr Leu Gly Glu Ala Ser Pro Ser Ser Gln Leu Leu Pro Pro

1085

1090

1095

cct gag gaa gag tac ccc cag atg aac aat gtc aac atc gat ttc  
3339

Pro Glu Glu Glu Tyr Pro Gln Met Asn Asn Val Asn Ile Asp Phe

1100

1105

1110

ttc tat cgg gaa ctt gac ctc ctt ggg tat gac tac agc aaa gac  
3384

Phe Tyr Arg Glu Leu Asp Leu Leu Gly Tyr Asp Tyr Ser Lys Asp

1115

1120

1125

ttc cgt cgt ttg cag acc atg aga agg gcc gac tcc aaa gct agc  
3429

Phe Arg Arg Leu Gln Thr Met Arg Arg Ala Asp Ser Lys Ala Ser

1130

1135

1140



ggc acc ttg gct ttc ctt cca ctt aag gat gaa ttg cgc aat gag  
 3474  
 Gly Thr Leu Ala Phe Leu Pro Leu Lys Asp Glu Leu Arg Asn Glu

1145

1150

1155

ccc ctc ttg ctc cac cca gcg ccc ctg gac atc gcg ttc cag act  
 3519  
 Pro Leu Leu Leu His Pro Ala Pro Leu Asp Ile Ala Phe Gln Thr

1160

1165

1170

gtc att gga gcg tat tcc tct cca gga gat cgt cgc cta cgc tca  
 3564  
 Val Ile Gly Ala Tyr Ser Ser Pro Gly Asp Arg Arg Leu Arg Ser

1175

1180

1185

ttg tac gtg cct act cac gtt gac aga gtg act ctg att cca tcg  
 3609  
 Leu Tyr Val Pro Thr His Val Asp Arg Val Thr Leu Ile Pro Ser

1190

1195

1200

ctc tgt ata tcg gcg ggt aat tct ggt gaa acc gag ctt gcg ttt  
 3654  
 Leu Cys Ile Ser Ala Gly Asn Ser Gly Glu Thr Glu Leu Ala Phe

1205

1210

1215

gac aca atc aac aca cac gac aag ggt gat ttc ctg agc ggc gac  
 3699  
 Asp Thr Ile Asn Thr His Asp Lys Gly Asp Phe Leu Ser Gly Asp

1220

1225

1230

atc acg gtg tac gat tcg acc aag aca acg ctt ttc caa gtt gat  
 3744  
 Ile Thr Val Tyr Asp Ser Thr Lys Thr Thr Leu Phe Gln Val Asp

1235

1240

1245

aac att gtc ttt aag cct ttc tct ccc ccg act gct tcg acc gac



3789														
Asn	Ile	Val	Phe	Lys	Pro	Phe	Ser	Pro	Pro	Thr	Ala	Ser	Thr	Asp
1250					1255					1260				
cac cga atc ttc gca aag tgg gtc tgg gga ccc ctc acg ccc gaa														
3834														
His	Arg	Ile	Phe	Ala	Lys	Trp	Val	Trp	Gly	Pro	Leu	Thr	Pro	Glu
1265					1270					1275				
aaa ctg ctg gag gac cct gcg acg ttg atc ata gct cgg gac aag														
3879														
Lys	Leu	Leu	Glu	Asp	Pro	Ala	Thr	Leu	Ile	Ile	Ala	Arg	Asp	Lys
1280					1285					1290				
gag gac att ctg acc atc gag cga atc gtt tac ttc tac atc aaa														
3924														
Glu	Asp	Ile	Leu	Thr	Ile	Glu	Arg	Ile	Val	Tyr	Phe	Tyr	Ile	Lys
1295					1300					1305				
tcc ttc cta gcc cag ata acc ccc gac gac cgt caa aat gcc gac														
3969														
Ser	Phe	Leu	Ala	Gln	Ile	Thr	Pro	Asp	Asp	Arg	Gln	Asn	Ala	Asp
1310					1315					1320				
ctc cat tcc cag aag tac att gaa tgg tgt gac cag gtt cag gcc														
4014														
Leu	His	Ser	Gln	Lys	Tyr	Ile	Glu	Trp	Cys	Asp	Gln	Val	Gln	Ala
1325					1330					1335				
gat gct cgg gct ggc cac cat cag tgg tac cag gag tct tgg gag														
4059														
Asp	Ala	Arg	Ala	Gly	His	His	Gln	Trp	Tyr	Gln	Glu	Ser	Trp	Glu
1340					1345					1350				
gag gac act tct gtt cac att gag caa atg tgt gaa agc aac tcg														
4104														



Glu Asp	Thr Ser	Val His	Ile	Glu Gln	Met Cys	Glu	Ser Asn	Ser
1355			1360			1365		

tcc cac	cca cat	gtg cgc	ctg	atc caa	agg gta	ggc	aaa gaa	tta
4149								
Ser His	Pro His	Val Arg	Leu	Ile Gln	Arg Val	Gly	Lys Glu	Leu
1370			1375			1380		

att tca	att gtt	cgc ggg	aac	ggg gat	cct ttg	gat	atc atg	aac
4194								
Ile Ser	Ile Val	Arg Gly	Asn	Gly Asp	Pro Leu	Asp	Ile Met	Asn
1385			1390			1395		

cgc gat	ggg ttg	ttc acc	gag	tac tat	acc aac	aag	ctc gcc	ttt
4239								
Arg Asp	Gly Leu	Phe Thr	Glu	Tyr Tyr	Thr Asn	Lys	Leu Ala	Phe
1400			1405			1410		

ggc tca	gca ata	cac gtc	gtt	cag gat	ctg gtt	agc	caa att	gct
4284								
Gly Ser	Ala Ile	His Val	Val	Gln Asp	Leu Val	Ser	Gln Ile	Ala
1415			1420			1425		

cat cgc	tac caa	tcc att	gat	atc ctt	gag atc	ggc	ttg ggt	aca
4329								
His Arg	Tyr Gln	Ser Ile	Asp	Ile Leu	Glu Ile	Gly	Leu Gly	Thr
1430			1435			1440		

ggc atc	gcc acg	aag cgc	gtt	ctt gca	tca cct	caa	ctt ggt	ttc
4374								
Gly Ile	Ala Thr	Lys Arg	Val	Leu Ala	Ser Pro	Gln	Leu Gly	Phe
1445			1450			1455		

aac agt	tac act	tgc act	gac	atc tcg	gcg gat	gtt	att ggc	aag
4419								
Asn Ser	Tyr Thr	Cys Thr	Asp	Ile Ser	Ala Asp	Val	Ile Gly	Lys



1460		1465		1470
gcc cgt	gaa caa ctt tcc gaa	ttc gac ggt ctc atg	cag ttt gag	
4464				
Ala Arg	Glu Gln Leu Ser Glu	Phe Asp Gly Leu Met	Gln Phe Glu	
1475		1480		1485
gca cta	gac atc aac aga agc	cca gca gag caa gga	ttc aag cct	
4509				
Ala Leu	Asp Ile Asn Arg Ser	Pro Ala Glu Gln Gly	Phe Lys Pro	
1490		1495		1500
cac tcc	tac gat ctg att att	gca tcc gat gtc ctc	cat gcc agc	
4554				
His Ser	Tyr Asp Leu Ile Ile	Ala Ser Asp Val Leu	His Ala Ser	
1505		1510		1515
tcc aac	ttc gag gaa aaa ttg	gct cac ata agg tcc	ttg ctc aag	
4599				
Ser Asn	Phe Glu Glu Lys Leu	Ala His Ile Arg Ser	Leu Leu Lys	
1520		1525		1530
ccg ggt	ggt cac ttg gtt act	ttc ggg gtc acc cat	cgc gag cct	
4644				
Pro Gly	Gly His Leu Val Thr	Phe Gly Val Thr His	Arg Glu Pro	
1535		1540		1545
gct cgc	ctc gcc ttc atc tct	ggg ctt ttc gct gat	cga tgg act	
4689				
Ala Arg	Leu Ala Phe Ile Ser	Gly Leu Phe Ala Asp	Arg Trp Thr	
1550		1555		1560
gga gaa	gac gaa act cgt gct	ttg agt gcc tcg ggg	tcc gtt gac	
4734				
Gly Glu	Asp Glu Thr Arg Ala	Leu Ser Ala Ser Gly	Ser Val Asp	



1565	1570	1575
caa tgg	gag cat acc ctc aag	aga gtt ggg ttc tct
4779		ggc gtc gat
Gln Trp	Glu His Thr Leu Lys	Arg Val Gly Phe Ser
		Gly Val Asp
1580	1585	1590
agt cgg	aca ctt gat cga gag	gat gat ttg atc ccg
4824		tct gtc ttc
Ser Arg	Thr Leu Asp Arg Glu	Asp Asp Leu Ile Pro
		Ser Val Phe
1595	1600	1605
agt aca	cat gct gtg gat gcc	acc gtt gag cgt ttg
4869		tat gat cca
Ser Thr	His Ala Val Asp Ala	Thr Val Glu Arg Leu
		Tyr Asp Pro
1610	1615	1620
ctt tct	gct cca ttg aag gac	tca tac ccg cca tta
4914		gtg gtt atc
Leu Ser	Ala Pro Leu Lys Asp	Ser Tyr Pro Pro Leu
		Val Val Ile
1625	1630	1635
ggg ggc	gaa tcg aca aaa acc	gaa cgc att ttg aac
4959		gac atg aaa
Gly Gly	Glu Ser Thr Lys Thr	Glu Arg Ile Leu Asn
		Asp Met Lys
1640	1645	1650
gct gcc	cta ccg cat aga cac	atc cac tcc gtc aag
5004		cgg ctg gaa
Ala Ala	Leu Pro His Arg His	Ile His Ser Val Lys
		Arg Leu Glu
1655	1660	1665
agt gtt	ctc gac gac ccg gcc	ttg cag cct aag tcg
5049		act ttt gtc
Ser Val	Leu Asp Asp Pro Ala	Leu Gln Pro Lys Ser
		Thr Phe Val
1670	1675	1680



atc ctc tcg gaa ctt gat gat gaa gtg ttt tgc aac ctt gaa gag  
5094

Ile Leu Ser Glu Leu Asp Asp Glu Val Phe Cys Asn Leu Glu Glu

1685

1690

1695

gac aag ttt gag gca gtc aag tct ctt ctc ttc tac gcc gga cgc  
5139

Asp Lys Phe Glu Ala Val Lys Ser Leu Leu Phe Tyr Ala Gly Arg

1700

1705

1710

atg atg tgg ctg aca gag aat gcc tgg att gat cat ccc cac cag  
5184

Met Met Trp Leu Thr Glu Asn Ala Trp Ile Asp His Pro His Gln

1715

1720

1725

gcc agc acc atc gga atg ttg agg aca atc aag ctc gag aac cct  
5229

Ala Ser Thr Ile Gly Met Leu Arg Thr Ile Lys Leu Glu Asn Pro

1730

1735

1740

gac ttg gga acg cac gtc ttc gat gtc gat act gtg gag aac cta  
5274

Asp Leu Gly Thr His Val Phe Asp Val Asp Thr Val Glu Asn Leu

1745

1750

1755

gac acc aaa ttc ttc gtt gag caa ctt ttg cgc ttc gag gag agc  
5319

Asp Thr Lys Phe Phe Val Glu Gln Leu Leu Arg Phe Glu Glu Ser

1760

1765

1770

gat gat cag ctt ttg gaa tca ata aca tgg act cat gag ccc gaa  
5364

Asp Asp Gln Leu Leu Glu Ser Ile Thr Trp Thr His Glu Pro Glu

1775

1780

1785



gtg tac tgg tgc aag ggt cgt gcc tgg gtc cct cgt ttg aag cag  
5409  
Val Tyr Trp Cys Lys Gly Arg Ala Trp Val Pro Arg Leu Lys Gln  
1790 1795 1800

gat att gct agg aac gac cgt atg aac tcg tct cgt cgt cca att  
5454  
Asp Ile Ala Arg Asn Asp Arg Met Asn Ser Ser Arg Arg Pro Ile  
1805 1810 1815

ttc ggt aac ttt aat tcg tcc aag acg gcc att gca ctg aaa gag  
5499  
Phe Gly Asn Phe Asn Ser Ser Lys Thr Ala Ile Ala Leu Lys Glu  
1820 1825 1830

gcg agg gga gca tcc tca tcg atg tac tat ctt gag tca acc gag  
5544  
Ala Arg Gly Ala Ser Ser Ser Met Tyr Tyr Leu Glu Ser Thr Glu  
1835 1840 1845

acg tgt gat tcg tta gaa gac gct cgt cat gct gga aaa gca act  
5589  
Thr Cys Asp Ser Leu Glu Asp Ala Arg His Ala Gly Lys Ala Thr  
1850 1855 1860

gtt cgt gtt cgc tac gct ctt ccc cag gca att cgc gtg ggc cat  
5634  
Val Arg Val Arg Tyr Ala Leu Pro Gln Ala Ile Arg Val Gly His  
1865 1870 1875

ctc gga tac ttc cat gtc gtg cag ggc agt att ctg gag aat aca  
5679  
Leu Gly Tyr Phe His Val Val Gln Gly Ser Ile Leu Glu Asn Thr  
1880 1885 1890

tgt gag gtg cct gta gtc gcc ctg gct gag aag aat gga tct ata



5724  
 Cys Glu Val Pro Val Val Ala Leu Ala Glu Lys Asn Gly Ser Ile  
 1895 1900 1905

ctg cat gta ccg aga aac tac atg cat agt ctg ccc gat aac atg  
 5769  
 Leu His Val Pro Arg Asn Tyr Met His Ser Leu Pro Asp Asn Met  
 1910 1915 1920

gcg gaa ggc gag gat agt tcc ttc ttg ttg tcc aca gct gca gcc  
 5814  
 Ala Glu Gly Glu Asp Ser Ser Phe Leu Leu Ser Thr Ala Ala Ala  
 1925 1930 1935

ctc ctt gcc gaa aca att ctc tct agc gct cag tcc ttt ggc tct  
 5859  
 Leu Leu Ala Glu Thr Ile Leu Ser Ser Ala Gln Ser Phe Gly Ser  
 1940 1945 1950

gat gca tca att ctg att atg gag ccc cca atc ttc tgc gtc aaa  
 5904  
 Asp Ala Ser Ile Leu Ile Met Glu Pro Pro Ile Phe Cys Val Lys  
 1955 1960 1965

gca att ctg gag tcg gcc aaa acc tac ggt gtt cag gtt cat ttg  
 5949  
 Ala Ile Leu Glu Ser Ala Lys Thr Tyr Gly Val Gln Val His Leu  
 1970 1975 1980

gca aca act ctg tcc gac gtc aaa act att ccg gct cct tgg atc  
 5994  
 Ala Thr Thr Leu Ser Asp Val Lys Thr Ile Pro Ala Pro Trp Ile  
 1985 1990 1995

cga tta cat gcc aag gaa acc gac gct cgg ctg aaa cac agc ctg  
 6039



Arg	Leu	His	Ala	Lys	Glu	Thr	Asp	Ala	Arg	Leu	Lys	His	Ser	Leu
2000				2005				2010						

ccg	aca	aac	atg	atg	gca	ttc	ttt	gac	ttg	tct	acc	gac	cgg	act
6084														
Pro	Thr	Asn	Met	Met	Ala	Phe	Phe	Asp	Leu	Ser	Thr	Asp	Arg	Thr
2015				2020				2025						

gct	gcc	ggg	ata	acc	aac	cgt	ttg	gcc	aag	ttg	cta	cca	ccc	agt
6129														
Ala	Ala	Gly	Ile	Thr	Asn	Arg	Leu	Ala	Lys	Leu	Leu	Pro	Pro	Ser
2030				2035				2040						

tgc	ttc	atg	tac	agt	ggg	gac	tat	ctt	atc	cga	agt	aca	gct	tcc
6174														
Cys	Phe	Met	Tyr	Ser	Gly	Asp	Tyr	Leu	Ile	Arg	Ser	Thr	Ala	Ser
2045				2050				2055						

aca	tac	aaa	gtt	agt	cat	gtt	gag	gat	att	cca	atc	ctc	gag	cac
6219														
Thr	Tyr	Lys	Val	Ser	His	Val	Glu	Asp	Ile	Pro	Ile	Leu	Glu	His
2060				2065				2070						

tct	gtg	gca	atg	gca	aaa	aat	acc	gtc	tct	gcg	tcg	act	gtc	gac
6264														
Ser	Val	Ala	Met	Ala	Lys	Asn	Thr	Val	Ser	Ala	Ser	Thr	Val	Asp
2075				2080				2085						

gac	act	gag	aaa	gtt	att	aca	gcc	aca	caa	att	ctc	ttg	cct	ggt
6309														
Asp	Thr	Glu	Lys	Val	Ile	Thr	Ala	Thr	Gln	Ile	Leu	Leu	Pro	Gly
2090				2095				2100						

cag	ctc	tct	gtc	aac	cac	aat	gac	caa	cgc	ttc	aat	ctg	gcc	acc
6354														
Gln	Leu	Ser	Val	Asn	His	Asn	Asp	Gln	Arg	Phe	Asn	Leu	Ala	Thr



2105	2110	2115
gtc atc 6399	gac tgg aag gaa aat	gag gtg tcc gct agg att tgc ccc
Val Ile	Asp Trp Lys Glu Asn	Glu Val Ser Ala Arg Ile Cys Pro
2120	2125	2130
atc gac 6444	tct ggt aac tta ttt	tcc aac aag aag acg tat ttg ctt
Ile Asp	Ser Gly Asn Leu Phe	Ser Asn Lys Lys Thr Tyr Leu Leu
2135	2140	2145
gtt ggt 6489	ctt acc ggg gac ctt	ggc cgc tct ctc tgt cgc tgg atg
Val Gly	Leu Thr Gly Asp Leu	Gly Arg Ser Leu Cys Arg Trp Met
2150	2155	2160
atc ttg 6534	cat ggc gcc cgc cat	gtt gtg ctc act agc cgg aac cct
Ile Leu	His Gly Ala Arg His	Val Val Leu Thr Ser Arg Asn Pro
2165	2170	2175
cga ctt 6579	gat ccc aaa tgg atc	gcc aac atg gag gca ctt ggt ggt
Arg Leu	Asp Pro Lys Trp Ile	Ala Asn Met Glu Ala Leu Gly Gly
2180	2185	2190
gac atc 6624	acc gtt ctg tca atg	gat gtt gcc aat gag gat tca gtc
Asp Ile	Thr Val Leu Ser Met	Asp Val Ala Asn Glu Asp Ser Val
2195	2200	2205
gat gct 6669	ggc ctt ggc aag ctt	gtc gat atg aag ttg cca cct gtt
Asp Ala	Gly Leu Gly Lys Leu	Val Asp Met Lys Leu Pro Pro Val



2210	2215	2220
gcc ggc atc gcg ttc ggg cct	ttg gtg ctg cag gat	gtc atg ctg
6714		
Ala Gly Ile Ala Phe Gly Pro	Leu Val Leu Gln Asp	Val Met Leu
2225	2230	2235
aag aac atg gac cac cag atg	atg gac atg gtg ttg	aag ccc aag
6759		
Lys Asn Met Asp His Gln Met	Met Asp Met Val Leu	Lys Pro Lys
2240	2245	2250
gta caa gga gca cgc att ctt	cat gaa cgg ttc tcc	gaa cag acg
6804		
Val Gln Gly Ala Arg Ile Leu	His Glu Arg Phe Ser	Glu Gln Thr
2255	2260	2265
ggc agc aag gcg ctc gac ttc	ttc atc atg ttt tcg	tcc att gtt
6849		
Gly Ser Lys Ala Leu Asp Phe	Phe Ile Met Phe Ser	Ser Ile Val
2270	2275	2280
gca gtt att ggc aat cct ggc	cag tcc aac tat ggc	gct gcg aat
6894		
Ala Val Ile Gly Asn Pro Gly	Gln Ser Asn Tyr Gly	Ala Ala Asn
2285	2290	2295
gcc tac cta cag gct ctg gcc	cag caa cgg tgc gcc	aga gga ttg
6939		
Ala Tyr Leu Gln Ala Leu Ala	Gln Gln Arg Cys Ala	Arg Gly Leu
2300	2305	2310
gcg gga tca acc atc gat att	ggc gcc gtt tac ggt	gta ggg ttt
6984		
Ala Gly Ser Thr Ile Asp Ile	Gly Ala Val Tyr Gly	Val Gly Phe
2315	2320	2325



gtc acg agg gcc gag atg gag gag gac ttt gat gct atc cgt ttc  
7029

Val Thr Arg Ala Glu Met Glu Glu Asp Phe Asp Ala Ile Arg Phe

2330

2335

2340

atg ttt gac tca gtt gaa gag cat gag ctg cac acg ctt ttc gcc  
7074

Met Phe Asp Ser Val Glu Glu His Glu Leu His Thr Leu Phe Ala

2345

2350

2355

gaa gcg gtc gtg tct gac cag cgt gcc cgg cag caa cca cag cgc  
7119

Glu Ala Val Val Ser Asp Gln Arg Ala Arg Gln Gln Pro Gln Arg

2360

2365

2370

aag acg gtc att gac atg gcg gac ctt gag ctt acc acg ggt atc  
7164

Lys Thr Val Ile Asp Met Ala Asp Leu Glu Leu Thr Thr Gly Ile

2375

2380

2385

cca gat ctt gac cct gcg ctt caa gat cga att att tac ttc aac  
7209

Pro Asp Leu Asp Pro Ala Leu Gln Asp Arg Ile Ile Tyr Phe Asn

2390

2395

2400

gac cct cgt ttc gga aac ttc aaa att ccc ggt caa cgc gga gac  
7254

Asp Pro Arg Phe Gly Asn Phe Lys Ile Pro Gly Gln Arg Gly Asp

2405

2410

2415

ggt ggc gac aat gga tca ggg tct aaa ggc tcc att gcc gac cag  
7299

Gly Gly Asp Asn Gly Ser Gly Ser Lys Gly Ser Ile Ala Asp Gln

2420

2425

2430



ctc aaa caa gca aca act tta gac caa gtt cgg caa atc gtg att  
7344  
Leu Lys Gln Ala Thr Thr Leu Asp Gln Val Arg Gln Ile Val Ile

2435

2440

2445

gat ggt cta tct gag aaa ctc cgt gtt acc ctc caa gtt tcg gac  
7389  
Asp Gly Leu Ser Glu Lys Leu Arg Val Thr Leu Gln Val Ser Asp

2450

2455

2460

ggg gag agc gtg gac cca acc att cct ctc att gat caa ggt gtc  
7434  
Gly Glu Ser Val Asp Pro Thr Ile Pro Leu Ile Asp Gln Gly Val

2465

2470

2475

gac tcc ttg ggt gca gtg act gtc ggc tca tgg ttc tca aag caa  
7479  
Asp Ser Leu Gly Ala Val Thr Val Gly Ser Trp Phe Ser Lys Gln

2480

2485

2490

ctc tac ctt gac ctc cca ctc ttg agg gta ctt ggc ggt gct tct  
7524  
Leu Tyr Leu Asp Leu Pro Leu Leu Arg Val Leu Gly Gly Ala Ser

2495

2500

2505

gtc gct gat ctt gcc gac gac gcg gcc acc cga ctc cca gct aca  
7569  
Val Ala Asp Leu Ala Asp Asp Ala Ala Thr Arg Leu Pro Ala Thr

2510

2515

2520

tcc att ccg ctg ctg ttg caa att ggt gat tcc acg gga acc tcg  
7614  
Ser Ile Pro Leu Leu Leu Gln Ile Gly Asp Ser Thr Gly Thr Ser

2525

2530

2535

gac agc ggg gct tct ccg aca cca aca gac agc cat gat gaa gca



7659  
 Asp Ser Gly Ala Ser Pro Thr Pro Thr Asp Ser His Asp Glu Ala  
 2540 2545 2550

agc tct gct acc agc aca gat gcg tcg tca gcc gaa gag gat gaa  
 7704  
 Ser Ser Ala Thr Ser Thr Asp Ala Ser Ser Ala Glu Glu Asp Glu  
 2555 2560 2565

gag caa gag gac gat aat gag cag gga ggc cgt aag att ctt cgt  
 7749  
 Glu Gln Glu Asp Asp Asn Glu Gln Gly Gly Arg Lys Ile Leu Arg  
 2570 2575 2580

cgc gag agg ttg tcc ctt ggc cag gag tat tcc tgg agg cag caa  
 7794  
 Arg Glu Arg Leu Ser Leu Gly Gln Glu Tyr Ser Trp Arg Gln Gln  
 2585 2590 2595

caa atg gta aaa gat cat acc atc ttc aac aac act att ggc atg  
 7839  
 Gln Met Val Lys Asp His Thr Ile Phe Asn Asn Thr Ile Gly Met  
 2600 2605 2610

ttc atg aag ggt acc att gac ctc gac cgg ttg agg cgg gct ctg  
 7884  
 Phe Met Lys Gly Thr Ile Asp Leu Asp Arg Leu Arg Arg Ala Leu  
 2615 2620 2625

aaa gcc tca ttg cgc cgt cac gag atc ttc cgt acg tgc ttt gtt  
 7929  
 Lys Ala Ser Leu Arg Arg His Glu Ile Phe Arg Thr Cys Phe Val  
 2630 2635 2640

act ggc gat gac tat agc agc gat tta aat ggt ccc gtc caa gtg  
 7974



Thr	Gly	Asp	Asp	Tyr	Ser	Ser	Asp	Leu	Asn	Gly	Pro	Val	Gln	Val
2645				2650				2655						

ggt	ctc	aag	aac	ccg	gag	aac	aga	gtg	cac	ttt	ggt	cag	gtg	aac
8019														
Val	Leu	Lys	Asn	Pro	Glu	Asn	Arg	Val	His	Phe	Val	Gln	Val	Asn
2660				2665				2670						

aac	gct	gcg	gag	gca	gag	gaa	gag	tac	cgg	aaa	ctc	gag	aag	aca
8064														
Asn	Ala	Ala	Glu	Ala	Glu	Glu	Glu	Tyr	Arg	Lys	Leu	Glu	Lys	Thr
2675				2680				2685						

aac	tat	agc	atc	tcc	aca	ggt	gac	act	ctc	aga	ctc	ggt	gat	ttc
8109														
Asn	Tyr	Ser	Ile	Ser	Thr	Gly	Asp	Thr	Leu	Arg	Leu	Val	Asp	Phe
2690				2695				2700						

tac	tgg	ggc	aca	gat	gac	cac	ctg	ttg	gta	atc	ggc	tac	cac	aga
8154														
Tyr	Trp	Gly	Thr	Asp	Asp	His	Leu	Leu	Val	Ile	Gly	Tyr	His	Arg
2705				2710				2715						

tta	ggt	ggt	gat	ggc	tca	aca	aca	gaa	aac	ctg	ttc	aat	gag	atc
8199														
Leu	Val	Gly	Asp	Gly	Ser	Thr	Thr	Glu	Asn	Leu	Phe	Asn	Glu	Ile
2720				2725				2730						

ggg	cag	att	tac	agc	ggg	gtg	aaa	atg	cag	cga	cca	tcg	acc	caa
8244														
Gly	Gln	Ile	Tyr	Ser	Gly	Val	Lys	Met	Gln	Arg	Pro	Ser	Thr	Gln
2735				2740				2745						

ttc	tct	gat	cta	gcc	gtc	caa	cag	cgg	gaa	aac	ctg	gaa	aat	ggg
8289														
Phe	Ser	Asp	Leu	Ala	Val	Gln	Gln	Arg	Glu	Asn	Leu	Glu	Asn	Gly



2750		2755		2760
cga atg 8334	ggg gac gat atc gcg	ttc tgg aag tcc atg	cat agc aaa	
Arg Met	Gly Asp Asp Ile Ala	Phe Trp Lys Ser Met	His Ser Lys	
2765		2770		2775
gtc tcg 8379	tca tct gcg cca acc	gtg ctt ccc atc atg	aat ctg atc	
Val Ser	Ser Ser Ala Pro Thr	Val Leu Pro Ile Met	Asn Leu Ile	
2780		2785		2790
aat gac 8424	cct gct gcc aat tca	gag cag cag caa ata	cag cca ttc	
Asn Asp	Pro Ala Ala Asn Ser	Glu Gln Gln Gln Ile	Gln Pro Phe	
2795		2800		2805
acg tgg 8469	cag cag tat gaa gca	att gct cgt tta gat	ccc atg gtc	
Thr Trp	Gln Gln Tyr Glu Ala	Ile Ala Arg Leu Asp	Pro Met Val	
2810		2815		2820
gcc ttc 8514	cga atc aaa gag cgg	agc cgc aag cac aag	gca acc ccc	
Ala Phe	Arg Ile Lys Glu Arg	Ser Arg Lys His Lys	Ala Thr Pro	
2825		2830		2835
atg cag 8559	ttc tac ctg gcc gcc	tac cac gtt ttg ttg	gcg cgt ctt	
Met Gln	Phe Tyr Leu Ala Ala	Tyr His Val Leu Leu	Ala Arg Leu	
2840		2845		2850
acc ggc 8604	agc aaa gac ata acc	atc ggc ctc gcc gaa	acc aac cga	
Thr Gly	Ser Lys Asp Ile Thr	Ile Gly Leu Ala Glu	Thr Asn Arg	



2855	2860	2865
tcc acc atg gaa gaa att tcg gcg atg ggc ttt ttc gct aac gtg 8649		
Ser Thr Met Glu Glu Ile Ser Ala Met Gly Phe Phe Ala Asn Val		
2870	2875	2880
ctt ccc ctg cgc ttt gat gag ttc gtc ggc agc aag aca ttc ggc 8694		
Leu Pro Leu Arg Phe Asp Glu Phe Val Gly Ser Lys Thr Phe Gly		
2885	2890	2895
gag cac ctt gta gcc acc aag gac agt gtg cgt gag gcc atg caa 8739		
Glu His Leu Val Ala Thr Lys Asp Ser Val Arg Glu Ala Met Gln		
2900	2905	2910
cac gcg cgg gtg ccg tat ggc gtc atc ctc gac tgt cta ggc ctg 8784		
His Ala Arg Val Pro Tyr Gly Val Ile Leu Asp Cys Leu Gly Leu		
2915	2920	2925
aat ctc cct acc tca ggc gag gaa ccc aag act cag aca cac gcc 8829		
Asn Leu Pro Thr Ser Gly Glu Glu Pro Lys Thr Gln Thr His Ala		
2930	2935	2940
ccc ttg ttc cag gct gtc ttt gat tac aag cag ggt caa gcg gag 8874		
Pro Leu Phe Gln Ala Val Phe Asp Tyr Lys Gln Gly Gln Ala Glu		
2945	2950	2955
agt ggc tca att ggc aat gcc aaa atg acg agt gtt ctc gct tcc 8919		
Ser Gly Ser Ile Gly Asn Ala Lys Met Thr Ser Val Leu Ala Ser		
2960	2965	2970



cgt gag cgc act cct tat gac atc gtt ctc gag atg tgg gat gac  
8964

Arg Glu Arg Thr Pro Tyr Asp Ile Val Leu Glu Met Trp Asp Asp

2975

2980

2985

cct acc aag gac cca ctc att cat gtc aaa ctt cag agc tcg ctg  
9009

Pro Thr Lys Asp Pro Leu Ile His Val Lys Leu Gln Ser Ser Leu

2990

2995

3000

tat ggc cct gag cac gct cag gcc ttt gta gac cac ttt tct tca  
9054

Tyr Gly Pro Glu His Ala Gln Ala Phe Val Asp His Phe Ser Ser

3005

3010

3015

atc ctc act atg ttc tcg atg aac ccg gct ctg aag ttg gcc tag  
9099

Ile Leu Thr Met Phe Ser Met Asn Pro Ala Leu Lys Leu Ala

3020

3025

3030

<210> 44

<211> 3032

<212> PRT

<213> Penicillium citrinum

<400> 44

Met Asp Gln Ala Asn Tyr Pro Asn Glu Pro Ile Val Val Val Gly Ser  
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Gly Cys Arg Phe Pro Gly Gly Val Asn Thr Pro Ser Lys Leu Trp Glu  
20 25 30



Leu Leu Lys Glu Pro Arg Asp Val Gln Thr Lys Ile Pro Lys Glu Arg  
35 40 45

Phe Asp Val Asp Thr Phe Tyr Ser Pro Asp Gly Thr His Pro Gly Arg  
50 55 60

Thr Asn Ala Pro Phe Ala Tyr Leu Leu Gln Glu Asp Leu Arg Gly Phe  
65 70 75 80

Asp Ala Ser Phe Phe Asn Ile Gln Ala Gly Glu Ala Glu Thr Ile Asp  
85 90 95

Pro Gln Gln Arg Leu Leu Leu Glu Thr Val Tyr Glu Ala Val Ser Asn  
100 105 110

Ala Gly Leu Arg Ile Gln Gly Leu Gln Gly Ser Ser Thr Ala Val Tyr  
115 120 125

Val Gly Met Met Thr His Asp Tyr Glu Thr Ile Val Thr Arg Glu Leu  
130 135 140

Asp Ser Ile Pro Thr Tyr Ser Ala Thr Gly Val Ala Val Ser Val Ala  
145 150 155 160

Ser Asn Arg Val Ser Tyr Phe Phe Asp Trp His Gly Pro Ser Met Thr  
165 170 175

Ile Asp Thr Ala Cys Ser Ser Ser Leu Ala Ala Val His Leu Ala Val  
180 185 190

Gln Gln Leu Arg Thr Gly Glu Ser Thr Met Ala Val Ala Ala Gly Ala  
195 200 205

Asn Leu Ile Leu Gly Pro Met Thr Phe Val Met Glu Ser Lys Leu Asn  
210 215 220

Met Leu Ser Pro Asn Gly Arg Ser Arg Met Trp Asp Ala Ala Ala Asp  
225 230 235 240



Gly Tyr Ala Arg Gly Glu Gly Val Cys Ser Ile Val Leu Lys Thr Leu  
245 250 255

Ser Gln Ala Leu Arg Asp Gly Asp Ser Ile Glu Cys Val Ile Arg Glu  
260 265 270

Thr Gly Ile Asn Gln Asp Gly Arg Thr Thr Gly Ile Thr Met Pro Asn  
275 280 285

His Ser Ala Gln Glu Ala Leu Ile Arg Ala Thr Tyr Ala Lys Ala Gly  
290 295 300

Leu Asp Ile Thr Asn Pro Gln Glu Arg Cys Gln Phe Phe Glu Ala His  
305 310 315 320

Gly Thr Gly Thr Pro Ala Gly Asp Pro Gln Glu Ala Glu Ala Ile Ala  
325 330 335

Thr Ala Phe Phe Gly His Lys Asp Gly Thr Ile Asp Ser Asp Gly Glu  
340 345 350

Lys Asp Glu Leu Phe Val Gly Ser Ile Lys Thr Val Leu Gly His Thr  
355 360 365

Glu Gly Thr Ala Gly Ile Ala Gly Leu Met Lys Ala Ser Phe Ala Val  
370 375 380

Arg Asn Gly Val Ile Pro Pro Asn Leu Leu Phe Glu Lys Ile Ser Pro  
385 390 395 400

Arg Val Ala Pro Phe Tyr Thr His Leu Lys Ile Ala Thr Glu Ala Thr  
405 410 415

Glu Trp Pro Ile Val Ala Pro Gly Gln Pro Arg Arg Val Ser Val Asn  
420 425 430

Ser Phe Gly Phe Gly Gly Thr Asn Ala His Ala Ile Ile Glu Glu Tyr



435					440					445					
Met	Ala	Pro	Pro	His	Lys	Pro	Thr	Ala	Val	Val	Thr	Glu	Val	Thr	Ser
450						455					460				
Asp	Ala	Asp	Ala	Cys	Ser	Leu	Pro	Leu	Val	Leu	Ser	Ser	Lys	Ser	Gln
465					470					475					480
Arg	Ser	Met	Lys	Ala	Thr	Leu	Glu	Asn	Met	Leu	Gln	Phe	Leu	Glu	Thr
				485					490					495	
His	Asp	Asp	Val	Asp	Met	His	Asp	Ile	Ala	Tyr	Thr	Leu	Leu	Glu	Lys
			500					505					510		
Arg	Ser	Ile	Leu	Pro	Phe	Arg	Arg	Ala	Ile	Ala	Ala	His	Asn	Lys	Glu
		515					520					525			
Val	Ala	Arg	Ala	Ala	Leu	Glu	Ala	Ala	Ile	Ala	Asp	Gly	Glu	Val	Val
	530					535					540				
Thr	Asp	Phe	Arg	Thr	Asp	Ala	Asn	Asp	Asn	Pro	Arg	Val	Leu	Gly	Val
545					550					555					560
Phe	Thr	Gly	Gln	Gly	Ala	Gln	Trp	Pro	Gly	Met	Leu	Lys	Lys	Leu	Met
				565					570					575	
Val	Gly	Met	Pro	Phe	Val	Arg	Gly	Ile	Leu	Glu	Glu	Leu	Asp	Asn	Ser
			580					585					590		
Leu	Gln	Thr	Leu	Pro	Glu	Lys	Tyr	Arg	Pro	Thr	Trp	Thr	Leu	Tyr	Asp
		595					600					605			
Gln	Leu	Met	Leu	Glu	Gly	Asp	Ala	Ser	Asn	Val	Arg	Leu	Ala	Ser	Phe
	610					615					620				
Ser	Gln	Pro	Leu	Cys	Cys	Ala	Val	Gln	Ile	Val	Leu	Val	Arg	Leu	Leu
625					630					635					640



Ala Ala Ala Gly Ile Glu Phe Ser Ala Ile Val Gly His Ser Ser Gly  
645 650 655

Glu Ile Ala Cys Ala Phe Ala Ala Gly Phe Ile Ser Ala Thr Gln Ala  
660 665 670

Ile Arg Ile Ala His Leu Arg Gly Val Val Ser Ala Glu His Ala Ser  
675 680 685

Ser Pro Ser Gly Gln Thr Gly Ala Met Leu Ala Ala Gly Met Ser Tyr  
690 695 700

Asp Asp Ala Lys Glu Leu Cys Glu Leu Glu Ala Phe Glu Gly Arg Val  
705 710 715 720

Cys Val Ala Ala Ser Asn Ser Pro Asp Ser Val Thr Phe Ser Gly Asp  
725 730 735

Met Asp Ala Ile Gln His Val Glu Gly Val Leu Glu Asp Glu Ser Thr  
740 745 750

Phe Ala Arg Ile Leu Arg Val Asp Lys Ala Tyr His Ser His His Met  
755 760 765

His Pro Cys Ala Ala Pro Tyr Val Lys Ala Leu Leu Glu Cys Asp Cys  
770 775 780

Ala Val Ala Asp Gly Gln Gly Asn Asp Ser Val Ala Trp Phe Ser Ala  
785 790 795 800

Val His Glu Thr Ser Lys Gln Met Thr Val Gln Asp Val Met Pro Ala  
805 810 815

Tyr Trp Lys Asp Asn Leu Val Ser Pro Val Leu Phe Ser Gln Ala Val  
820 825 830

Gln Lys Ala Val Ile Thr His Arg Leu Ile Asp Val Ala Ile Glu Ile  
835 840 845



Gly Ala His Pro Ala Leu Lys Gly Pro Cys Leu Ala Thr Ile Lys Asp  
850 855 860

Ala Leu Ala Gly Val Glu Leu Pro Tyr Thr Gly Cys Leu Ala Arg Asn  
865 870 875 880

Val Asp Asp Val Asp Ala Phe Ala Gly Gly Leu Gly Tyr Ile Trp Glu  
885 890 895

Arg Phe Gly Val Arg Ser Ile Asp Ala Glu Gly Phe Val Gln Gln Val  
900 905 910

Arg Pro Asp Arg Ala Val Gln Asn Leu Ser Lys Ser Leu Pro Thr Tyr  
915 920 925

Ser Trp Asp His Thr Arg Gln Tyr Trp Ala Glu Ser Arg Ser Thr Arg  
930 935 940

Gln His Leu Arg Gly Gly Ala Pro His Leu Leu Leu Gly Lys Leu Ser  
945 950 955 960

Ser Tyr Ser Thr Ala Ser Thr Phe Gln Trp Thr Asn Phe Ile Arg Pro  
965 970 975

Arg Asp Leu Glu Trp Leu Asp Gly His Ala Leu Gln Gly Gln Thr Val  
980 985 990

Phe Pro Ala Ala Gly Tyr Ile Ile Met Ala Met Glu Ala Ala Met Lys  
995 1000 1005

Val Ala Gly Glu Arg Ala Ala Gln Val Gln Leu Leu Glu Ile Leu  
1010 1015 1020

Asp Met Ser Ile Asn Lys Ala Ile Val Phe Glu Asp Glu Asn Thr  
1025 1030 1035

Ser Val Glu Leu Asn Leu Thr Ala Glu Val Thr Ser Asp Asn Asp



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Ala	Asp	Gly	Gln	Val	Thr	Val	Lys	Phe	Val	Ile	Asp	Ser	Cys	Leu	
	1055						1060				1065				
Ala	Lys	Glu	Ser	Glu	Leu	Ser	Thr	Ser	Ala	Lys	Gly	Gln	Ile	Val	
	1070						1075				1080				
Ile	Thr	Leu	Gly	Glu	Ala	Ser	Pro	Ser	Ser	Gln	Leu	Leu	Pro	Pro	
	1085						1090				1095				
Pro	Glu	Glu	Glu	Tyr	Pro	Gln	Met	Asn	Asn	Val	Asn	Ile	Asp	Phe	
	1100						1105				1110				
Phe	Tyr	Arg	Glu	Leu	Asp	Leu	Leu	Gly	Tyr	Asp	Tyr	Ser	Lys	Asp	
	1115						1120				1125				
Phe	Arg	Arg	Leu	Gln	Thr	Met	Arg	Arg	Ala	Asp	Ser	Lys	Ala	Ser	
	1130						1135				1140				
Gly	Thr	Leu	Ala	Phe	Leu	Pro	Leu	Lys	Asp	Glu	Leu	Arg	Asn	Glu	
	1145						1150				1155				
Pro	Leu	Leu	Leu	His	Pro	Ala	Pro	Leu	Asp	Ile	Ala	Phe	Gln	Thr	
	1160						1165				1170				
Val	Ile	Gly	Ala	Tyr	Ser	Ser	Pro	Gly	Asp	Arg	Arg	Leu	Arg	Ser	
	1175						1180				1185				
Leu	Tyr	Val	Pro	Thr	His	Val	Asp	Arg	Val	Thr	Leu	Ile	Pro	Ser	
	1190						1195				1200				
Leu	Cys	Ile	Ser	Ala	Gly	Asn	Ser	Gly	Glu	Thr	Glu	Leu	Ala	Phe	
	1205						1210				1215				
Asp	Thr	Ile	Asn	Thr	His	Asp	Lys	Gly	Asp	Phe	Leu	Ser	Gly	Asp	
	1220						1225				1230				



Ile Thr Val Tyr Asp Ser Thr Lys Thr Thr Leu Phe Gln Val Asp  
1235 1240 1245

Asn Ile Val Phe Lys Pro Phe Ser Pro Pro Thr Ala Ser Thr Asp  
1250 1255 1260

His Arg Ile Phe Ala Lys Trp Val Trp Gly Pro Leu Thr Pro Glu  
1265 1270 1275

Lys Leu Leu Glu Asp Pro Ala Thr Leu Ile Ile Ala Arg Asp Lys  
1280 1285 1290

Glu Asp Ile Leu Thr Ile Glu Arg Ile Val Tyr Phe Tyr Ile Lys  
1295 1300 1305

Ser Phe Leu Ala Gln Ile Thr Pro Asp Asp Arg Gln Asn Ala Asp  
1310 1315 1320

Leu His Ser Gln Lys Tyr Ile Glu Trp Cys Asp Gln Val Gln Ala  
1325 1330 1335

Asp Ala Arg Ala Gly His His Gln Trp Tyr Gln Glu Ser Trp Glu  
1340 1345 1350

Glu Asp Thr Ser Val His Ile Glu Gln Met Cys Glu Ser Asn Ser  
1355 1360 1365

Ser His Pro His Val Arg Leu Ile Gln Arg Val Gly Lys Glu Leu  
1370 1375 1380

Ile Ser Ile Val Arg Gly Asn Gly Asp Pro Leu Asp Ile Met Asn  
1385 1390 1395

Arg Asp Gly Leu Phe Thr Glu Tyr Tyr Thr Asn Lys Leu Ala Phe  
1400 1405 1410

Gly Ser Ala Ile His Val Val Gln Asp Leu Val Ser Gln Ile Ala  
1415 1420 1425



His Arg Tyr Gln Ser Ile Asp Ile Leu Glu Ile Gly Leu Gly Thr  
1430 1435 1440

Gly Ile Ala Thr Lys Arg Val Leu Ala Ser Pro Gln Leu Gly Phe  
1445 1450 1455

Asn Ser Tyr Thr Cys Thr Asp Ile Ser Ala Asp Val Ile Gly Lys  
1460 1465 1470

Ala Arg Glu Gln Leu Ser Glu Phe Asp Gly Leu Met Gln Phe Glu  
1475 1480 1485

Ala Leu Asp Ile Asn Arg Ser Pro Ala Glu Gln Gly Phe Lys Pro  
1490 1495 1500

His Ser Tyr Asp Leu Ile Ile Ala Ser Asp Val Leu His Ala Ser  
1505 1510 1515

Ser Asn Phe Glu Glu Lys Leu Ala His Ile Arg Ser Leu Leu Lys  
1520 1525 1530

Pro Gly Gly His Leu Val Thr Phe Gly Val Thr His Arg Glu Pro  
1535 1540 1545

Ala Arg Leu Ala Phe Ile Ser Gly Leu Phe Ala Asp Arg Trp Thr  
1550 1555 1560

Gly Glu Asp Glu Thr Arg Ala Leu Ser Ala Ser Gly Ser Val Asp  
1565 1570 1575

Gln Trp Glu His Thr Leu Lys Arg Val Gly Phe Ser Gly Val Asp  
1580 1585 1590

Ser Arg Thr Leu Asp Arg Glu Asp Asp Leu Ile Pro Ser Val Phe  
1595 1600 1605

Ser Thr His Ala Val Asp Ala Thr Val Glu Arg Leu Tyr Asp Pro



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Leu	Ser	Ala	Pro	Leu	Lys	Asp	Ser	Tyr	Pro	Pro	Leu	Val	Val	Ile
1625						1630					1635			
Gly	Gly	Glu	Ser	Thr	Lys	Thr	Glu	Arg	Ile	Leu	Asn	Asp	Met	Lys
1640						1645					1650			
Ala	Ala	Leu	Pro	His	Arg	His	Ile	His	Ser	Val	Lys	Arg	Leu	Glu
1655						1660					1665			
Ser	Val	Leu	Asp	Asp	Pro	Ala	Leu	Gln	Pro	Lys	Ser	Thr	Phe	Val
1670						1675					1680			
Ile	Leu	Ser	Glu	Leu	Asp	Asp	Glu	Val	Phe	Cys	Asn	Leu	Glu	Glu
1685						1690					1695			
Asp	Lys	Phe	Glu	Ala	Val	Lys	Ser	Leu	Leu	Phe	Tyr	Ala	Gly	Arg
1700						1705					1710			
Met	Met	Trp	Leu	Thr	Glu	Asn	Ala	Trp	Ile	Asp	His	Pro	His	Gln
1715						1720					1725			
Ala	Ser	Thr	Ile	Gly	Met	Leu	Arg	Thr	Ile	Lys	Leu	Glu	Asn	Pro
1730						1735					1740			
Asp	Leu	Gly	Thr	His	Val	Phe	Asp	Val	Asp	Thr	Val	Glu	Asn	Leu
1745						1750					1755			
Asp	Thr	Lys	Phe	Phe	Val	Glu	Gln	Leu	Leu	Arg	Phe	Glu	Glu	Ser
1760						1765					1770			
Asp	Asp	Gln	Leu	Leu	Glu	Ser	Ile	Thr	Trp	Thr	His	Glu	Pro	Glu
1775						1780					1785			
Val	Tyr	Trp	Cys	Lys	Gly	Arg	Ala	Trp	Val	Pro	Arg	Leu	Lys	Gln
1790						1795					1800			



Asp	Ile	Ala	Arg	Asn	Asp	Arg	Met	Asn	Ser	Ser	Arg	Arg	Pro	Ile
1805						1810					1815			
Phe	Gly	Asn	Phe	Asn	Ser	Ser	Lys	Thr	Ala	Ile	Ala	Leu	Lys	Glu
1820						1825					1830			
Ala	Arg	Gly	Ala	Ser	Ser	Ser	Met	Tyr	Tyr	Leu	Glu	Ser	Thr	Glu
1835						1840					1845			
Thr	Cys	Asp	Ser	Leu	Glu	Asp	Ala	Arg	His	Ala	Gly	Lys	Ala	Thr
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Val	Arg	Val	Arg	Tyr	Ala	Leu	Pro	Gln	Ala	Ile	Arg	Val	Gly	His
1865						1870					1875			
Leu	Gly	Tyr	Phe	His	Val	Val	Gln	Gly	Ser	Ile	Leu	Glu	Asn	Thr
1880						1885					1890			
Cys	Glu	Val	Pro	Val	Val	Ala	Leu	Ala	Glu	Lys	Asn	Gly	Ser	Ile
1895						1900					1905			
Leu	His	Val	Pro	Arg	Asn	Tyr	Met	His	Ser	Leu	Pro	Asp	Asn	Met
1910						1915					1920			
Ala	Glu	Gly	Glu	Asp	Ser	Ser	Phe	Leu	Leu	Ser	Thr	Ala	Ala	Ala
1925						1930					1935			
Leu	Leu	Ala	Glu	Thr	Ile	Leu	Ser	Ser	Ala	Gln	Ser	Phe	Gly	Ser
1940						1945					1950			
Asp	Ala	Ser	Ile	Leu	Ile	Met	Glu	Pro	Pro	Ile	Phe	Cys	Val	Lys
1955						1960					1965			
Ala	Ile	Leu	Glu	Ser	Ala	Lys	Thr	Tyr	Gly	Val	Gln	Val	His	Leu
1970						1975					1980			
Ala	Thr	Thr	Leu	Ser	Asp	Val	Lys	Thr	Ile	Pro	Ala	Pro	Trp	Ile
1985						1990					1995			



Arg Leu His Ala Lys Glu Thr Asp Ala Arg Leu Lys His Ser Leu  
2000 2005 2010

Pro Thr Asn Met Met Ala Phe Phe Asp Leu Ser Thr Asp Arg Thr  
2015 2020 2025

Ala Ala Gly Ile Thr Asn Arg Leu Ala Lys Leu Leu Pro Pro Ser  
2030 2035 2040

Cys Phe Met Tyr Ser Gly Asp Tyr Leu Ile Arg Ser Thr Ala Ser  
2045 2050 2055

Thr Tyr Lys Val Ser His Val Glu Asp Ile Pro Ile Leu Glu His  
2060 2065 2070

Ser Val Ala Met Ala Lys Asn Thr Val Ser Ala Ser Thr Val Asp  
2075 2080 2085

Asp Thr Glu Lys Val Ile Thr Ala Thr Gln Ile Leu Leu Pro Gly  
2090 2095 2100

Gln Leu Ser Val Asn His Asn Asp Gln Arg Phe Asn Leu Ala Thr  
2105 2110 2115

Val Ile Asp Trp Lys Glu Asn Glu Val Ser Ala Arg Ile Cys Pro  
2120 2125 2130

Ile Asp Ser Gly Asn Leu Phe Ser Asn Lys Lys Thr Tyr Leu Leu  
2135 2140 2145

Val Gly Leu Thr Gly Asp Leu Gly Arg Ser Leu Cys Arg Trp Met  
2150 2155 2160

Ile Leu His Gly Ala Arg His Val Val Leu Thr Ser Arg Asn Pro  
2165 2170 2175

Arg Leu Asp Pro Lys Trp Ile Ala Asn Met Glu Ala Leu Gly Gly



2180						2185					2190			
Asp	Ile	Thr	Val	Leu	Ser	Met	Asp	Val	Ala	Asn	Glu	Asp	Ser	Val
2195						2200					2205			
Asp	Ala	Gly	Leu	Gly	Lys	Leu	Val	Asp	Met	Lys	Leu	Pro	Pro	Val
2210						2215					2220			
Ala	Gly	Ile	Ala	Phe	Gly	Pro	Leu	Val	Leu	Gln	Asp	Val	Met	Leu
2225						2230					2235			
Lys	Asn	Met	Asp	His	Gln	Met	Met	Asp	Met	Val	Leu	Lys	Pro	Lys
2240						2245					2250			
Val	Gln	Gly	Ala	Arg	Ile	Leu	His	Glu	Arg	Phe	Ser	Glu	Gln	Thr
2255						2260					2265			
Gly	Ser	Lys	Ala	Leu	Asp	Phe	Phe	Ile	Met	Phe	Ser	Ser	Ile	Val
2270						2275					2280			
Ala	Val	Ile	Gly	Asn	Pro	Gly	Gln	Ser	Asn	Tyr	Gly	Ala	Ala	Asn
2285						2290					2295			
Ala	Tyr	Leu	Gln	Ala	Leu	Ala	Gln	Gln	Arg	Cys	Ala	Arg	Gly	Leu
2300						2305					2310			
Ala	Gly	Ser	Thr	Ile	Asp	Ile	Gly	Ala	Val	Tyr	Gly	Val	Gly	Phe
2315						2320					2325			
Val	Thr	Arg	Ala	Glu	Met	Glu	Glu	Asp	Phe	Asp	Ala	Ile	Arg	Phe
2330						2335					2340			
Met	Phe	Asp	Ser	Val	Glu	Glu	His	Glu	Leu	His	Thr	Leu	Phe	Ala
2345						2350					2355			
Glu	Ala	Val	Val	Ser	Asp	Gln	Arg	Ala	Arg	Gln	Gln	Pro	Gln	Arg
2360						2365					2370			



Lys Thr Val Ile Asp Met Ala Asp Leu Glu Leu Thr Thr Gly Ile  
2375 2380 2385

Pro Asp Leu Asp Pro Ala Leu Gln Asp Arg Ile Ile Tyr Phe Asn  
2390 2395 2400

Asp Pro Arg Phe Gly Asn Phe Lys Ile Pro Gly Gln Arg Gly Asp  
2405 2410 2415

Gly Gly Asp Asn Gly Ser Gly Ser Lys Gly Ser Ile Ala Asp Gln  
2420 2425 2430

Leu Lys Gln Ala Thr Thr Leu Asp Gln Val Arg Gln Ile Val Ile  
2435 2440 2445

Asp Gly Leu Ser Glu Lys Leu Arg Val Thr Leu Gln Val Ser Asp  
2450 2455 2460

Gly Glu Ser Val Asp Pro Thr Ile Pro Leu Ile Asp Gln Gly Val  
2465 2470 2475

Asp Ser Leu Gly Ala Val Thr Val Gly Ser Trp Phe Ser Lys Gln  
2480 2485 2490

Leu Tyr Leu Asp Leu Pro Leu Leu Arg Val Leu Gly Gly Ala Ser  
2495 2500 2505

Val Ala Asp Leu Ala Asp Asp Ala Ala Thr Arg Leu Pro Ala Thr  
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Ser Ile Pro Leu Leu Leu Gln Ile Gly Asp Ser Thr Gly Thr Ser  
2525 2530 2535

Asp Ser Gly Ala Ser Pro Thr Pro Thr Asp Ser His Asp Glu Ala  
2540 2545 2550

Ser Ser Ala Thr Ser Thr Asp Ala Ser Ser Ala Glu Glu Asp Glu  
2555 2560 2565



Glu Gln Glu Asp Asp Asn Glu Gln Gly Gly Arg Lys Ile Leu Arg  
2570 2575 2580

Arg Glu Arg Leu Ser Leu Gly Gln Glu Tyr Ser Trp Arg Gln Gln  
2585 2590 2595

Gln Met Val Lys Asp His Thr Ile Phe Asn Asn Thr Ile Gly Met  
2600 2605 2610

Phe Met Lys Gly Thr Ile Asp Leu Asp Arg Leu Arg Arg Ala Leu  
2615 2620 2625

Lys Ala Ser Leu Arg Arg His Glu Ile Phe Arg Thr Cys Phe Val  
2630 2635 2640

Thr Gly Asp Asp Tyr Ser Ser Asp Leu Asn Gly Pro Val Gln Val  
2645 2650 2655

Val Leu Lys Asn Pro Glu Asn Arg Val His Phe Val Gln Val Asn  
2660 2665 2670

Asn Ala Ala Glu Ala Glu Glu Glu Tyr Arg Lys Leu Glu Lys Thr  
2675 2680 2685

Asn Tyr Ser Ile Ser Thr Gly Asp Thr Leu Arg Leu Val Asp Phe  
2690 2695 2700

Tyr Trp Gly Thr Asp Asp His Leu Leu Val Ile Gly Tyr His Arg  
2705 2710 2715

Leu Val Gly Asp Gly Ser Thr Thr Glu Asn Leu Phe Asn Glu Ile  
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Gly Gln Ile Tyr Ser Gly Val Lys Met Gln Arg Pro Ser Thr Gln  
2735 2740 2745

Phe Ser Asp Leu Ala Val Gln Gln Arg Glu Asn Leu Glu Asn Gly



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Arg	Met	Gly	Asp	Asp	Ile	Ala	Phe	Trp	Lys	Ser	Met	His	Ser	Lys
2765						2770					2775			
Val	Ser	Ser	Ser	Ala	Pro	Thr	Val	Leu	Pro	Ile	Met	Asn	Leu	Ile
2780						2785					2790			
Asn	Asp	Pro	Ala	Ala	Asn	Ser	Glu	Gln	Gln	Gln	Ile	Gln	Pro	Phe
2795						2800					2805			
Thr	Trp	Gln	Gln	Tyr	Glu	Ala	Ile	Ala	Arg	Leu	Asp	Pro	Met	Val
2810						2815					2820			
Ala	Phe	Arg	Ile	Lys	Glu	Arg	Ser	Arg	Lys	His	Lys	Ala	Thr	Pro
2825						2830					2835			
Met	Gln	Phe	Tyr	Leu	Ala	Ala	Tyr	His	Val	Leu	Leu	Ala	Arg	Leu
2840						2845					2850			
Thr	Gly	Ser	Lys	Asp	Ile	Thr	Ile	Gly	Leu	Ala	Glu	Thr	Asn	Arg
2855						2860					2865			
Ser	Thr	Met	Glu	Glu	Ile	Ser	Ala	Met	Gly	Phe	Phe	Ala	Asn	Val
2870						2875					2880			
Leu	Pro	Leu	Arg	Phe	Asp	Glu	Phe	Val	Gly	Ser	Lys	Thr	Phe	Gly
2885						2890					2895			
Glu	His	Leu	Val	Ala	Thr	Lys	Asp	Ser	Val	Arg	Glu	Ala	Met	Gln
2900						2905					2910			
His	Ala	Arg	Val	Pro	Tyr	Gly	Val	Ile	Leu	Asp	Cys	Leu	Gly	Leu
2915						2920					2925			
Asn	Leu	Pro	Thr	Ser	Gly	Glu	Glu	Pro	Lys	Thr	Gln	Thr	His	Ala
2930						2935					2940			



Pro Leu Phe Gln Ala Val Phe Asp Tyr Lys Gln Gly Gln Ala Glu  
2945 2950 2955

Ser Gly Ser Ile Gly Asn Ala Lys Met Thr Ser Val Leu Ala Ser  
2960 2965 2970

Arg Glu Arg Thr Pro Tyr Asp Ile Val Leu Glu Met Trp Asp Asp  
2975 2980 2985

Pro Thr Lys Asp Pro Leu Ile His Val Lys Leu Gln Ser Ser Leu  
2990 2995 3000

Tyr Gly Pro Glu His Ala Gln Ala Phe Val Asp His Phe Ser Ser  
3005 3010 3015

Ile Leu Thr Met Phe Ser Met Asn Pro Ala Leu Lys Leu Ala  
3020 3025 3030

<210> 45

<211> 7692

<212> DNA

<213> Penicillium citrinum

<220>

<221> CDS

<222> (1)..(7692)

<400> 45

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48

Met Asn Asn Thr Pro Ala Val Thr Ala Thr Ala Thr Ala Thr

1

5

10

15



gca acc gca atg gca ggc tcg gct tgc tct aac aca tcc acg ccc att  
96  
Ala Thr Ala Met Ala Gly Ser Ala Cys Ser Asn Thr Ser Thr Pro Ile

20

25

30

gcc ata gtt gga atg gga tgt cga ttt gct gga gat gca acg agt cca  
144  
Ala Ile Val Gly Met Gly Cys Arg Phe Ala Gly Asp Ala Thr Ser Pro

35

40

45

cag aag ctt tgg gaa atg gtt gaa aga gga ggc agt gcc tgg tct aag  
192  
Gln Lys Leu Trp Glu Met Val Glu Arg Gly Gly Ser Ala Trp Ser Lys

50

55

60

gtc ccc tcc tcg cga ttc aat gtg aga gga gta tac cac ccg aat ggc  
240  
Val Pro Ser Ser Arg Phe Asn Val Arg Gly Val Tyr His Pro Asn Gly

65

70

75

80

gaa agg gtc ggg tcc acc cac gta aag ggt gga cac ttc atc gac gag  
288  
Glu Arg Val Gly Ser Thr His Val Lys Gly Gly His Phe Ile Asp Glu

85

90

95

gat cct gct tta ttt gac gcc gcg ttc ttc aac atg acc aca gag gtc  
336  
Asp Pro Ala Leu Phe Asp Ala Ala Phe Phe Asn Met Thr Thr Glu Val

100

105

110

gcc agc tgc atg gat ccg cag tat cgg ctt atg ctt gag gtg gtc tac  
384  
Ala Ser Cys Met Asp Pro Gln Tyr Arg Leu Met Leu Glu Val Val Tyr

115

120

125

gaa tcg ctg gag agt gcc ggt atc acc atc gat ggt atg gca ggc tct



432  
Glu Ser Leu Glu Ser Ala Gly Ile Thr Ile Asp Gly Met Ala Gly Ser  
130 135 140

aat acg tcg gtg ttt ggg ggt gtc atg tac cac gac tat cag gat tcg  
480  
Asn Thr Ser Val Phe Gly Gly Val Met Tyr His Asp Tyr Gln Asp Ser  
145 150 155 160

ctc aat cgt gac ccc gag aca gtt ccg cgt tat ttc ata act ggc aac  
528  
Leu Asn Arg Asp Pro Glu Thr Val Pro Arg Tyr Phe Ile Thr Gly Asn  
165 170 175

tca gga aca atg ctt tcg aac cgg ata tca cac ttc tac gac tta cgt  
576  
Ser Gly Thr Met Leu Ser Asn Arg Ile Ser His Phe Tyr Asp Leu Arg  
180 185 190

ggt ccc agc gtg acg gtt gac acg gcc tgt tcg acg aca ttg acc gca  
624  
Gly Pro Ser Val Thr Val Asp Thr Ala Cys Ser Thr Thr Leu Thr Ala  
195 200 205

ctg cac ttg gcg tgc cag agc tta cgt act ggg gag tca gat aca gcc  
672  
Leu His Leu Ala Cys Gln Ser Leu Arg Thr Gly Glu Ser Asp Thr Ala  
210 215 220

atc gtt atc ggt gca aat ctt ctg ctc aat ccc gat gtt ttt gtt acg  
720  
Ile Val Ile Gly Ala Asn Leu Leu Leu Asn Pro Asp Val Phe Val Thr  
225 230 235 240

atg tca aac ctg gga ttt ttg tcc ccg gat ggt atc tcg tac tct ttt  
768



Met Ser Asn Leu Gly Phe Leu Ser Pro Asp Gly Ile Ser Tyr Ser Phe  
245 250 255

gat cct cga gcg aat gga tat ggt cgc ggg gaa gga att gcc gct ctg  
816  
Asp Pro Arg Ala Asn Gly Tyr Gly Arg Gly Glu Gly Ile Ala Ala Leu  
260 265 270

gta ata aag gcc ctc cct aac gcg ttg cga gac caa gac cct atc cga  
864  
Val Ile Lys Ala Leu Pro Asn Ala Leu Arg Asp Gln Asp Pro Ile Arg  
275 280 285

gcc gtc att cga gag aca gcg ctg aac cag gat ggc aaa aca ccc gca  
912  
Ala Val Ile Arg Glu Thr Ala Leu Asn Gln Asp Gly Lys Thr Pro Ala  
290 295 300

att act gcg ccg agt gat gtg gcg cag aaa agt ctg atc cag gag tgt  
960  
Ile Thr Ala Pro Ser Asp Val Ala Gln Lys Ser Leu Ile Gln Glu Cys  
305 310 315 320

tac gat aag gct ggg cta gat atg tcg ttg acc tcg tac gtg gag gcc  
1008  
Tyr Asp Lys Ala Gly Leu Asp Met Ser Leu Thr Ser Tyr Val Glu Ala  
325 330 335

cac gga act gga aca cca act ggt gac ccc ctt gaa atc tca gca att  
1056  
His Gly Thr Gly Thr Pro Thr Gly Asp Pro Leu Glu Ile Ser Ala Ile  
340 345 350

tca gca gct ttt aaa gga cat cct ctg cac ctt ggc tct gtg aaa gca  
1104  
Ser Ala Ala Phe Lys Gly His Pro Leu His Leu Gly Ser Val Lys Ala



355	360	365
aat att ggc cat aca gaa gcc gcc agt ggc ctg gcc agt ata atc aag		
1152		
Asn Ile Gly His Thr Glu Ala Ala Ser Gly Leu Ala Ser Ile Ile Lys		
370	375	380
gtg gcc ttg gcc ttg gag aag ggc ttg att ccc cct aat gcg cgg ttc		
1200		
Val Ala Leu Ala Leu Glu Lys Gly Leu Ile Pro Pro Asn Ala Arg Phe		
385	390	395
ctg caa aag aac agc aag ctg atg ctt gac caa aag aac atc aag atc		
1248		
Leu Gln Lys Asn Ser Lys Leu Met Leu Asp Gln Lys Asn Ile Lys Ile		
405	410	415
ccc atg tct gct caa gac tgg cct gtg aaa gat ggg act cgt cgc gca		
1296		
Pro Met Ser Ala Gln Asp Trp Pro Val Lys Asp Gly Thr Arg Arg Ala		
420	425	430
tct gtc aat aac ttc ggc ttt ggt ggt tcg aat gct cac gtc att ttg		
1344		
Ser Val Asn Asn Phe Gly Phe Gly Gly Ser Asn Ala His Val Ile Leu		
435	440	445
gaa tca tat gat cgc gca tca ttg gcc ctg cca gag gat caa gtg cat		
1392		
Glu Ser Tyr Asp Arg Ala Ser Leu Ala Leu Pro Glu Asp Gln Val His		
450	455	460
gtc aat ggt aac tct gag cat ggt agg gtt gag gat ggt tcc aaa cag		
1440		
Val Asn Gly Asn Ser Glu His Gly Arg Val Glu Asp Gly Ser Lys Gln		



465 470 475 480

agc cgc ata tac gtt gtg cgt gcc aag gac gag caa gct tgt cgg cga  
1488  
Ser Arg Ile Tyr Val Val Arg Ala Lys Asp Glu Gln Ala Cys Arg Arg

485 490 495

acg ata gca agc ctg cga gac tac att aaa tcc gtc gct gac att gac  
1536  
Thr Ile Ala Ser Leu Arg Asp Tyr Ile Lys Ser Val Ala Asp Ile Asp

500 505 510

ggg gaa ccc ttc ctc gcc agc ctc gcc tat aca cta ggc tct cgc cgt  
1584  
Gly Glu Pro Phe Leu Ala Ser Leu Ala Tyr Thr Leu Gly Ser Arg Arg

515 520 525

tcc att ctg cca tgg acg tca gtg tat gta gca gac agc ctt ggc ggc  
1632  
Ser Ile Leu Pro Trp Thr Ser Val Tyr Val Ala Asp Ser Leu Gly Gly

530 535 540

ctt gtt tct gcc ctc agc gat gag tcc aat caa cca aaa cga gcg aat  
1680  
Leu Val Ser Ala Leu Ser Asp Glu Ser Asn Gln Pro Lys Arg Ala Asn

545 550 555 560

gag aaa gta cgg ctc gga ttt gta ttc acc ggt cag ggg gcg cag tgg  
1728  
Glu Lys Val Arg Leu Gly Phe Val Phe Thr Gly Gln Gly Ala Gln Trp

565 570 575

cat gca atg ggc aga gag ctg gtc aat aca ttc cca gta ttc aaa cag  
1776  
His Ala Met Gly Arg Glu Leu Val Asn Thr Phe Pro Val Phe Lys Gln

580 585 590



gcg att ctt gaa tgt gat ggc tac atc aag caa ctg ggc gcg agt tgg  
1824

Ala Ile Leu Glu Cys Asp Gly Tyr Ile Lys Gln Leu Gly Ala Ser Trp

595

600

605

aat ttt atg gag gag ctc cac cgt gat gag ctg acg act cgg gta aat  
1872

Asn Phe Met Glu Glu Leu His Arg Asp Glu Leu Thr Thr Arg Val Asn

610

615

620

gat gcc gaa tac agt cta cca ctg tca acc gct atc caa att gca ctt  
1920

Asp Ala Glu Tyr Ser Leu Pro Leu Ser Thr Ala Ile Gln Ile Ala Leu

625

630

635

640

gtg cgt ctc ctt tgg tca tgg gga att cgg cca acg ggg ata acc agt  
1968

Val Arg Leu Leu Trp Ser Trp Gly Ile Arg Pro Thr Gly Ile Thr Ser

645

650

655

cac tca agt gga gag gct gct gct gcc tac gca gct ggg gct tta tcc  
2016

His Ser Ser Gly Glu Ala Ala Ala Ala Tyr Ala Ala Gly Ala Leu Ser

660

665

670

gcg cgg tcg gcc att ggg atc act tat ata cgc ggt gta ttg acc act  
2064

Ala Arg Ser Ala Ile Gly Ile Thr Tyr Ile Arg Gly Val Leu Thr Thr

675

680

685

aag ccc aag ccc gca ttg gca gcc aaa gga gga atg atg gcg gtg ggt  
2112

Lys Pro Lys Pro Ala Leu Ala Ala Lys Gly Gly Met Met Ala Val Gly

690

695

700



ctt ggt cgc agt gag acc aat gtt tac att tcg cgt ctc aac cag gag  
2160  
Leu Gly Arg Ser Glu Thr Asn Val Tyr Ile Ser Arg Leu Asn Gln Glu  
705 710 715 720

gac ggc tgt gtg gtg gtt gga tgt atc aac agt caa tgt agt gtg acg  
2208  
Asp Gly Cys Val Val Val Gly Cys Ile Asn Ser Gln Cys Ser Val Thr  
725 730 735

gtg tcg gga gat ttg ggt gca atc gag aaa ctt gaa aag ttg tta cac  
2256  
Val Ser Gly Asp Leu Gly Ala Ile Glu Lys Leu Glu Lys Leu Leu His  
740 745 750

gcc gat ggc atc ttt acc agg aaa ctg aaa gtc act gaa gcc ttc cat  
2304  
Ala Asp Gly Ile Phe Thr Arg Lys Leu Lys Val Thr Glu Ala Phe His  
755 760 765

tca agc cac atg cga cca atg gca gat gcc ttt ggg gcg tca ctg aga  
2352  
Ser Ser His Met Arg Pro Met Ala Asp Ala Phe Gly Ala Ser Leu Arg  
770 775 780

gat ctg ttc aac tcg gat aac aac aac gac aat ccc aat gct gac acc  
2400  
Asp Leu Phe Asn Ser Asp Asn Asn Asn Asp Asn Pro Asn Ala Asp Thr  
785 790 795 800

tca aag ggt gta tta tat tca tca cct aag act ggt agt cgc atg acc  
2448  
Ser Lys Gly Val Leu Tyr Ser Ser Pro Lys Thr Gly Ser Arg Met Thr  
805 810 815

gat ctt aaa ttg cta ttg gat ccc aca cac tgg atg gat agt atg cta



2496  
Asp Leu Lys Leu Leu Leu Asp Pro Thr His Trp Met Asp Ser Met Leu  
820 825 830

cag ccg gta gag ttc gag tcc tca ctc cgc gag atg tgc ttt gat ccc  
2544  
Gln Pro Val Glu Phe Glu Ser Ser Leu Arg Glu Met Cys Phe Asp Pro  
835 840 845

aac acc aaa gag aaa gcc gtc gat gtg att att gaa ata ggg cct cac  
2592  
Asn Thr Lys Glu Lys Ala Val Asp Val Ile Ile Glu Ile Gly Pro His  
850 855 860

gga gcg ctt ggt ggt cca atc aac caa gtc atg cag gat ctg ggt ctg  
2640  
Gly Ala Leu Gly Gly Pro Ile Asn Gln Val Met Gln Asp Leu Gly Leu  
865 870 875 880

aaa gga aca gat ata aac tat ctc agt tgc ctt tct cgc ggc aga agc  
2688  
Lys Gly Thr Asp Ile Asn Tyr Leu Ser Cys Leu Ser Arg Gly Arg Ser  
885 890 895

tcg ttg gag aca atg tat cgt gct gct acg gag ttg ata agc aag ggt  
2736  
Ser Leu Glu Thr Met Tyr Arg Ala Ala Thr Glu Leu Ile Ser Lys Gly  
900 905 910

tat ggg ctc aaa atg gac gct ata aac ttt cct cat gga aga aaa gag  
2784  
Tyr Gly Leu Lys Met Asp Ala Ile Asn Phe Pro His Gly Arg Lys Glu  
915 920 925

ccc aga gtg aag gta ctg agc gat ttg ccg gcg tac ccg tgg aat cac  
2832



Pro Arg Val Lys Val Leu Ser Asp Leu Pro Ala Tyr Pro Trp Asn His  
930 935 940

caa acc cgt tat tgg aga gag cct cgc ggc agt cgt gag tcc aaa cag  
2880  
Gln Thr Arg Tyr Trp Arg Glu Pro Arg Gly Ser Arg Glu Ser Lys Gln  
945 950 955 960

aga acc cat ccg cct cac act ttg ata ggc tca cgg gaa tct ctc tct  
2928  
Arg Thr His Pro Pro His Thr Leu Ile Gly Ser Arg Glu Ser Leu Ser  
965 970 975

cct cat ttc gcg cct aaa tgg aaa cat gtt ctc cgt ctg tca gat att  
2976  
Pro His Phe Ala Pro Lys Trp Lys His Val Leu Arg Leu Ser Asp Ile  
980 985 990

cca tgg ata cga gat cac gtc gtt ggt tcg agc atc atc ttt ccg gga  
3024  
Pro Trp Ile Arg Asp His Val Val Gly Ser Ser Ile Ile Phe Pro Gly  
995 1000 1005

gct ggc ttc atc agc atg gcc atc gag ggg ttt tca caa gtc tgc  
3069  
Ala Gly Phe Ile Ser Met Ala Ile Glu Gly Phe Ser Gln Val Cys  
1010 1015 1020

cca cca gtt gcg ggg gct agc atc aac tac aac ttg cgt gac gtt  
3114  
Pro Pro Val Ala Gly Ala Ser Ile Asn Tyr Asn Leu Arg Asp Val  
1025 1030 1035

gaa ctc gcg cag gct ctc ata ata ccc gct gat gca gaa gca gag  
3159  
Glu Leu Ala Gln Ala Leu Ile Ile Pro Ala Asp Ala Glu Ala Glu



1040		1045		1050
gtt gac	ctg cgc cta acg atc	cgt tca tgt gag gaa	agg tcc ctc	
3204				
Val Asp	Leu Arg Leu Thr Ile	Arg Ser Cys Glu Glu	Arg Ser Leu	
1055		1060		1065
ggc aca	aag aac tgg cat caa	ttt tct gtg cac tca	att tcg ggc	
3249				
Gly Thr	Lys Asn Trp His Gln	Phe Ser Val His Ser	Ile Ser Gly	
1070		1075		1080
gaa aat	aat acc tgg aca gaa	cac tgc acc gga tta	ata cgt tcg	
3294				
Glu Asn	Asn Thr Trp Thr Glu	His Cys Thr Gly Leu	Ile Arg Ser	
1085		1090		1095
gag agc	gaa aga agc cac ctt	gac tgt tca act gtg	gaa gcc tca	
3339				
Glu Ser	Glu Arg Ser His Leu	Asp Cys Ser Thr Val	Glu Ala Ser	
1100		1105		1110
cgc agg	ttg aat cta ggc tca	gat aac cgg agc att	gat ccc aac	
3384				
Arg Arg	Leu Asn Leu Gly Ser	Asp Asn Arg Ser Ile	Asp Pro Asn	
1115		1120		1125
gat ctc	tgg gag tcc tta cac	gcg aat ggg ata tgc	cac gga ccc	
3429				
Asp Leu	Trp Glu Ser Leu His	Ala Asn Gly Ile Cys	His Gly Pro	
1130		1135		1140
att ttt	cag aac att cag cga	att caa aac aat gga	cag ggc tcg	
3474				
Ile Phe	Gln Asn Ile Gln Arg	Ile Gln Asn Asn Gly	Gln Gly Ser	



1145	1150	1155
ttt tgc aga ttt tcc att gct 3519	gac act gcc tcg gct	atg cct cac
Phe Cys Arg Phe Ser Ile Ala	Asp Thr Ala Ser Ala	Met Pro His
1160	1165	1170
tcg tac gag aat cga cac atc 3564	gtc cat cct act act	ctg gac tcg
Ser Tyr Glu Asn Arg His Ile	Val His Pro Thr Thr	Leu Asp Ser
1175	1180	1185
gtg atc cag gcg gca tac acg 3609	gtg tta ccc tac gcg	gga aca cgt
Val Ile Gln Ala Ala Tyr Thr	Val Leu Pro Tyr Ala	Gly Thr Arg
1190	1195	1200
atg aaa acg gcc atg gta cca 3654	agg agg cta aga aat	gtc aaa ata
Met Lys Thr Ala Met Val Pro	Arg Arg Leu Arg Asn	Val Lys Ile
1205	1210	1215
tcc tct agc ctg gct gac ttg 3699	gag gct ggt gat gct	ctg gac gca
Ser Ser Ser Leu Ala Asp Leu	Glu Ala Gly Asp Ala	Leu Asp Ala
1220	1225	1230
cag gcc agc atc aag gat cgc 3744	aac tct caa tcc ttc	tct acc gac
Gln Ala Ser Ile Lys Asp Arg	Asn Ser Gln Ser Phe	Ser Thr Asp
1235	1240	1245
ttg gca gtg ttt gat gac tat 3789	gat agc ggt tct tct	ccc tcg gac
Leu Ala Val Phe Asp Asp Tyr	Asp Ser Gly Ser Ser	Pro Ser Asp
1250	1255	1260



gga atc cca gtc ata gag att gaa ggc ctt gtt ttc cag tcg gtt  
3834

Gly Ile Pro Val Ile Glu Ile Glu Gly Leu Val Phe Gln Ser Val

1265

1270

1275

gga agc agc ttc tct gac caa aag tca gac tcc aac gac aca gaa  
3879

Gly Ser Ser Phe Ser Asp Gln Lys Ser Asp Ser Asn Asp Thr Glu

1280

1285

1290

aat gcc tgc agc tcc tgg gtt tgg gcc cct gac atc agc ttg ggt  
3924

Asn Ala Cys Ser Ser Trp Val Trp Ala Pro Asp Ile Ser Leu Gly

1295

1300

1305

gac tcc act tgg ctc aaa gaa aag ttg agc act gag gct gag acg  
3969

Asp Ser Thr Trp Leu Lys Glu Lys Leu Ser Thr Glu Ala Glu Thr

1310

1315

1320

aaa gaa acg gaa ctc atg atg gac ctc cga aga tgc acg atc aac  
4014

Lys Glu Thr Glu Leu Met Met Asp Leu Arg Arg Cys Thr Ile Asn

1325

1330

1335

ttt ata cag gag gct gtc act gat ttg aca aat tct gat atc caa  
4059

Phe Ile Gln Glu Ala Val Thr Asp Leu Thr Asn Ser Asp Ile Gln

1340

1345

1350

cat ctg gat ggc cac ctt cag aag tat ttc gat tgg atg aat gtc  
4104

His Leu Asp Gly His Leu Gln Lys Tyr Phe Asp Trp Met Asn Val

1355

1360

1365



caa ttg gac ctt gcg aga caa aac aag ctc agc cca gcc agt tgc  
 4149  
 Gln Leu Asp Leu Ala Arg Gln Asn Lys Leu Ser Pro Ala Ser Cys  
 1370 1375 1380

gac tgg cta agt gac gat gct gag cag aag aaa tgc cta cag gcc  
 4194  
 Asp Trp Leu Ser Asp Asp Ala Glu Gln Lys Lys Cys Leu Gln Ala  
 1385 1390 1395

aga gtc gct gga gaa agc gtc aat ggc gag atg att tct cgt cta  
 4239  
 Arg Val Ala Gly Glu Ser Val Asn Gly Glu Met Ile Ser Arg Leu  
 1400 1405 1410

gga cct cag tta ata gca atg cta cgc cgc gaa aca gag cca ctt  
 4284  
 Gly Pro Gln Leu Ile Ala Met Leu Arg Arg Glu Thr Glu Pro Leu  
 1415 1420 1425

gag ttg atg atg caa gat cag ctg cta agc aga tac tac gtc aac  
 4329  
 Glu Leu Met Met Gln Asp Gln Leu Leu Ser Arg Tyr Tyr Val Asn  
 1430 1435 1440

gca atc aaa tgg agc cga tca aac gca caa gcc agc gag ctg atc  
 4374  
 Ala Ile Lys Trp Ser Arg Ser Asn Ala Gln Ala Ser Glu Leu Ile  
 1445 1450 1455

cga ctt tgc gcc cac aag aac ccg cgt tct cgc att ttg gag att  
 4419  
 Arg Leu Cys Ala His Lys Asn Pro Arg Ser Arg Ile Leu Glu Ile  
 1460 1465 1470

ggc gga ggc acg ggc ggc tgc aca aag ctt att gtc aat gca ttg



4464  
 Gly Gly Gly Thr Gly Gly Cys Thr Lys Leu Ile Val Asn Ala Leu  
 1475 1480 1485

gga aac acc aag ccg atc gat cgt tat gac ttc acc gat gtg tct  
 4509  
 Gly Asn Thr Lys Pro Ile Asp Arg Tyr Asp Phe Thr Asp Val Ser  
 1490 1495 1500

gcc ggg ttt ttc gag tcg gcg cgt gag caa ttt gcg gat tgg caa  
 4554  
 Ala Gly Phe Phe Glu Ser Ala Arg Glu Gln Phe Ala Asp Trp Gln  
 1505 1510 1515

gac gtg atg act ttc aaa aaa ttg gat att gaa agc gat ccc gag  
 4599  
 Asp Val Met Thr Phe Lys Lys Leu Asp Ile Glu Ser Asp Pro Glu  
 1520 1525 1530

caa caa ggg ttt gaa tgt gcc acc tac gat gtg gtc gtg gct tgc  
 4644  
 Gln Gln Gly Phe Glu Cys Ala Thr Tyr Asp Val Val Val Ala Cys  
 1535 1540 1545

cag gtc ctg cat gca act cga tgc atg aaa cga aca ctg agt aac  
 4689  
 Gln Val Leu His Ala Thr Arg Cys Met Lys Arg Thr Leu Ser Asn  
 1550 1555 1560

gtt cga aaa ttg ctc aag cct ggg ggc aac ttg att ttg gtt gag  
 4734  
 Val Arg Lys Leu Leu Lys Pro Gly Gly Asn Leu Ile Leu Val Glu  
 1565 1570 1575

act acc agg gat cag ctc gat ttg ttc ttt acc ttc gga ctg ttg  
 4779



Thr Thr	Arg Asp Gln Leu Asp	Leu Phe Phe Thr Phe	Gly Leu Leu
1580	1585	1590	
cca ggt	tgg tgg ctc agt gag	gag cct gag cgg aag	tcg acg cca
4824			
Pro Gly	Trp Trp Leu Ser Glu	Glu Pro Glu Arg Lys	Ser Thr Pro
1595	1600	1605	
tcg ctc	act acc gat ctt tgg	aac acc atg ttg gac	acg agc ggt
4869			
Ser Leu	Thr Thr Asp Leu Trp	Asn Thr Met Leu Asp	Thr Ser Gly
1610	1615	1620	
ttc aac	ggg gtg gaa ttg gag	gtt cgt gat tgt gaa	gac gat gag
4914			
Phe Asn	Gly Val Glu Leu Glu	Val Arg Asp Cys Glu	Asp Asp Glu
1625	1630	1635	
ttt tac	atg atc agc aca atg	cta tcg acg gct aga	aaa gag aat
4959			
Phe Tyr	Met Ile Ser Thr Met	Leu Ser Thr Ala Arg	Lys Glu Asn
1640	1645	1650	
aca acc	ccg gat aca gtg gca	gaa tcg gag gtg ctt	ttg ctg cac
5004			
Thr Thr	Pro Asp Thr Val Ala	Glu Ser Glu Val Leu	Leu Leu His
1655	1660	1665	
gga gcg	ctc cga cct cct tca	tct tgg ctg gaa agt	ctc cag gca
5049			
Gly Ala	Leu Arg Pro Pro Ser	Ser Trp Leu Glu Ser	Leu Gln Ala
1670	1675	1680	
gca att	tgt gaa aag acc agt	tct agc cca tcg atc	aac gct ctg
5094			
Ala Ile	Cys Glu Lys Thr Ser	Ser Ser Pro Ser Ile	Asn Ala Leu



1685	1690	1695
ggc gag 5139	gta gat acc act gga	agg aca tgc att ttt ctt ggg gaa
Gly Glu	Val Asp Thr Thr Gly	Arg Thr Cys Ile Phe Leu Gly Glu
1700	1705	1710
atg gag 5184	tcc tcg ctc ctt gga	gag gtg gga agc gag acc ttc aaa
Met Glu	Ser Ser Leu Leu Gly	Glu Val Gly Ser Glu Thr Phe Lys
1715	1720	1725
tcc atc 5229	acc gcg atg ctg aat	aac tgc aac gca ctt ctc tgg gtg
Ser Ile	Thr Ala Met Leu Asn	Asn Cys Asn Ala Leu Leu Trp Val
1730	1735	1740
tct aga 5274	gga gca gcc atg agc	tcc gag gat cca tgg aaa gct cta
Ser Arg	Gly Ala Ala Met Ser	Ser Glu Asp Pro Trp Lys Ala Leu
1745	1750	1755
cat att 5319	ggt ctg ctg cgt acc	atc cgc aac gaa aat aac ggg aag
His Ile	Gly Leu Leu Arg Thr	Ile Arg Asn Glu Asn Asn Gly Lys
1760	1765	1770
gaa tat 5364	gta tcg ttg gat ctc	gat cct tct cga aac gca tac acc
Glu Tyr	Val Ser Leu Asp Leu	Asp Pro Ser Arg Asn Ala Tyr Thr
1775	1780	1785
cac gag 5409	tcc ctg tat gct atc	tgc aat atc ttc aat ggc cgc ctc
His Glu	Ser Leu Tyr Ala Ile	Cys Asn Ile Phe Asn Gly Arg Leu



1790	1795	1800
ggc gac ctt tcc gaa gac aag 5454 Gly Asp Leu Ser Glu Asp Lys	gag ttt gaa ttt gca Glu Phe Glu Phe Ala	gag aga aac Glu Arg Asn
1805	1810	1815
ggc gtc atc cac gta ccg cga 5499 Gly Val Ile His Val Pro Arg	ctt ttc aat gac ccg Leu Phe Asn Asp Pro	cac tgg aag His Trp Lys
1820	1825	1830
gac caa gaa gcg gtt gag gtc 5544 Asp Gln Glu Ala Val Glu Val	aca ctg cag ccg ttc Thr Leu Gln Pro Phe	gag caa ccc Glu Gln Pro
1835	1840	1845
ggg cgt cgt ctg cgg atg gag 5589 Gly Arg Arg Leu Arg Met Glu	gtt gag acg cca ggg Val Glu Thr Pro Gly	ctc tta gac Leu Leu Asp
1850	1855	1860
tcc ctg caa ttt cga gac gac 5634 Ser Leu Gln Phe Arg Asp Asp	gaa gga cgt gaa ggc Glu Gly Arg Glu Gly	aag gat ctt Lys Asp Leu
1865	1870	1875
ccg gat gat tgg gta gaa atc 5679 Pro Asp Asp Trp Val Glu Ile	gaa ccc aaa gct ttc Glu Pro Lys Ala Phe	ggg ctc aat Gly Leu Asn
1880	1885	1890
ttt cgg gat gtc atg gtt gcc 5724 Phe Arg Asp Val Met Val Ala	atg ggt caa ttg gag Met Gly Gln Leu Glu	gcc aac cgt Ala Asn Arg
1895	1900	1905



gtg atg ggc ttc gaa tgc gcc gga gtg atc aca aag ctc ggt gga  
5769

Val Met Gly Phe Glu Cys Ala Gly Val Ile Thr Lys Leu Gly Gly

1910

1915

1920

gct gct gcc gct agc caa ggc ctc aga tta ggg gac cgc gta tgt  
5814

Ala Ala Ala Ala Ser Gln Gly Leu Arg Leu Gly Asp Arg Val Cys

1925

1930

1935

gca cta ctg aaa ggc cat tgg gcg acc aga aca cag acg ccg tac  
5859

Ala Leu Leu Lys Gly His Trp Ala Thr Arg Thr Gln Thr Pro Tyr

1940

1945

1950

act aat gtc gtc cgt att ccg gac gaa atg ggc ttc cca gaa gcc  
5904

Thr Asn Val Val Arg Ile Pro Asp Glu Met Gly Phe Pro Glu Ala

1955

1960

1965

gct tcg gtc ccc ctg gct ttc act acc gca tat att gcg ctt tat  
5949

Ala Ser Val Pro Leu Ala Phe Thr Thr Ala Tyr Ile Ala Leu Tyr

1970

1975

1980

acc acg gca aag cta cga cga ggc gaa aga gtc ttg atc cac agt  
5994

Thr Thr Ala Lys Leu Arg Arg Gly Glu Arg Val Leu Ile His Ser

1985

1990

1995

gga gct gga ggc gtc ggt caa gca gcg atc att ttg tcc cag ctt  
6039

Gly Ala Gly Gly Val Gly Gln Ala Ala Ile Ile Leu Ser Gln Leu

2000

2005

2010



gcg ggt gcc gag gtc ttc gtc aca gcg gga act caa gcc aag cgt  
6084  
Ala Gly Ala Glu Val Phe Val Thr Ala Gly Thr Gln Ala Lys Arg

2015

2020

2025

gac ttt gtc ggc gat aaa ttc ggc atc aat ccg gat cat atc ttc  
6129  
Asp Phe Val Gly Asp Lys Phe Gly Ile Asn Pro Asp His Ile Phe

2030

2035

2040

tcg agc agg aat gac tta ttc gtc gac ggc atc aaa gcc tac acg  
6174  
Ser Ser Arg Asn Asp Leu Phe Val Asp Gly Ile Lys Ala Tyr Thr

2045

2050

2055

ggc gga ctt ggc gtt cat gtc gtt cta aac tca ttg gca ggt caa  
6219  
Gly Gly Leu Gly Val His Val Val Leu Asn Ser Leu Ala Gly Gln

2060

2065

2070

ctc ctc caa gca agc ttt gac tgc atg gcc gaa ttc ggc aga ttt  
6264  
Leu Leu Gln Ala Ser Phe Asp Cys Met Ala Glu Phe Gly Arg Phe

2075

2080

2085

gtt gag att gga aaa aag gac ctg gag caa aac agc aga ctt gac  
6309  
Val Glu Ile Gly Lys Lys Asp Leu Glu Gln Asn Ser Arg Leu Asp

2090

2095

2100

atg ctg cca ttc acc cgg gac gtc tct ttc aca tca att gat ctt  
6354  
Met Leu Pro Phe Thr Arg Asp Val Ser Phe Thr Ser Ile Asp Leu

2105

2110

2115

ctc tcg tgg caa aga gcc aaa agt gaa gaa gta tcc gaa gcg ttg



6399  
Leu Ser Trp Gln Arg Ala Lys Ser Glu Glu Val Ser Glu Ala Leu  
2120 2125 2130

aac cat gtc aca aaa ctc ctc gag aca aaa gcg att ggc ttg att  
6444  
Asn His Val Thr Lys Leu Leu Glu Thr Lys Ala Ile Gly Leu Ile  
2135 2140 2145

ggt cca atc cag cag cac tcc ttg tca aac atc gag aag gcc ttc  
6489  
Gly Pro Ile Gln Gln His Ser Leu Ser Asn Ile Glu Lys Ala Phe  
2150 2155 2160

cgt acg atg cag agt ggt cag cat gtt ggc aaa gtt gtg gtc aat  
6534  
Arg Thr Met Gln Ser Gly Gln His Val Gly Lys Val Val Val Asn  
2165 2170 2175

gta tct ggg gac gaa ctg gtc cca gtc ggc gat gga ggg ttc tcg  
6579  
Val Ser Gly Asp Glu Leu Val Pro Val Gly Asp Gly Gly Phe Ser  
2180 2185 2190

ctg aag ctg aag cct gac agt tct tac cta gtt gct ggt ggg ctg  
6624  
Leu Lys Leu Lys Pro Asp Ser Ser Tyr Leu Val Ala Gly Gly Leu  
2195 2200 2205

ggg gga att gga aag cag atc tgt cag tgg ctt gtt gat cat ggc  
6669  
Gly Gly Ile Gly Lys Gln Ile Cys Gln Trp Leu Val Asp His Gly  
2210 2215 2220

gcg aag cac ttg att atc cta tcg aga agt gca aag gcc agt cca  
6714



Ala Lys His Leu Ile Ile Leu Ser Arg Ser Ala Lys Ala Ser Pro  
2225 2230 2235

ttc ata acc agc ttg caa aat caa cag tgc gct gtc tat cta cac  
6759  
Phe Ile Thr Ser Leu Gln Asn Gln Gln Cys Ala Val Tyr Leu His  
2240 2245 2250

gca tgt gac atc tca gat caa gat cag gtc acc aag gtg ctc cgg  
6804  
Ala Cys Asp Ile Ser Asp Gln Asp Gln Val Thr Lys Val Leu Arg  
2255 2260 2265

ttg tgc gaa gaa gca cat gca ccg cca att cga ggt atc ata caa  
6849  
Leu Cys Glu Glu Ala His Ala Pro Pro Ile Arg Gly Ile Ile Gln  
2270 2275 2280

ggt gcc atg gtt ctc aag gac gcg ctt cta tcg cga atg aca ttg  
6894  
Gly Ala Met Val Leu Lys Asp Ala Leu Leu Ser Arg Met Thr Leu  
2285 2290 2295

gat gaa ttt aat gca gca aca cgc cca aaa gta cag ggt agt tgg  
6939  
Asp Glu Phe Asn Ala Ala Thr Arg Pro Lys Val Gln Gly Ser Trp  
2300 2305 2310

tat ctt cac aag atc gca cag gat gtt gac ttc ttc gtg atg ctc  
6984  
Tyr Leu His Lys Ile Ala Gln Asp Val Asp Phe Phe Val Met Leu  
2315 2320 2325

tca tcc ctt gtt ggg gtc atg ggt ggg gca ggc cag gcc aat tac  
7029  
Ser Ser Leu Val Gly Val Met Gly Gly Ala Gly Gln Ala Asn Tyr



2330	2335	2340
gca gct 7074	gct ggt gca ttc cag	gac gca ctt gcg cac cac cgg aga
Ala Ala	Ala Gly Ala Phe Gln	Asp Ala Leu Ala His His Arg Arg
2345	2350	2355
gcc cat 7119	ggc atg ccg gct gtc	acc att gac ttg ggc atg gtc aag
Ala His	Gly Met Pro Ala Val	Thr Ile Asp Leu Gly Met Val Lys
2360	2365	2370
tct gtt 7164	gga tac gtg gct gaa	act ggc cgt ggt gtg gcc gac cgg
Ser Val	Gly Tyr Val Ala Glu	Thr Gly Arg Gly Val Ala Asp Arg
2375	2380	2385
ctc gct 7209	aga ata ggt tac aag	cct atg cat gaa aag gac gtc atg
Leu Ala	Arg Ile Gly Tyr Lys	Pro Met His Glu Lys Asp Val Met
2390	2395	2400
gat gtg 7254	ttg gag aag gca atc	ctg tgt tct tcc cct caa ttt cca
Asp Val	Leu Glu Lys Ala Ile	Leu Cys Ser Ser Pro Gln Phe Pro
2405	2410	2415
tca cct 7299	ccc gca gct gtg gtt	aca gga atc aac aca tcc ccg ggt
Ser Pro	Pro Ala Ala Val Val	Thr Gly Ile Asn Thr Ser Pro Gly
2420	2425	2430
gct cac 7344	tgg acc gag gca aac	tgg ata cag gaa cag cgg ttt gtg
Ala His	Trp Thr Glu Ala Asn	Trp Ile Gln Glu Gln Arg Phe Val



2435	2440	2445
gga ctt 7389	aaa tac cgc caa gtc	ctt cat gca gac caa tcc ttt gtc
Gly Leu	Lys Tyr Arg Gln Val	Leu His Ala Asp Gln Ser Phe Val
2450	2455	2460
tct tcg 7434	cat aaa aaa gga cca	gat ggc gtg cgg gcc caa cta agc
Ser Ser	His Lys Lys Gly Pro	Asp Gly Val Arg Ala Gln Leu Ser
2465	2470	2475
agg gtc 7479	acc tct cac gac gag	gcc att tct atc gtc ctc aaa gca
Arg Val	Thr Ser His Asp Glu	Ala Ile Ser Ile Val Leu Lys Ala
2480	2485	2490
atg acg 7524	gaa aag ctg atg cga	atg ttt ggt ctg gca gaa gac gac
Met Thr	Glu Lys Leu Met Arg	Met Phe Gly Leu Ala Glu Asp Asp
2495	2500	2505
atg tcc 7569	tcg tcc aaa aac ctg	gca ggt gtc ggc gta gac tca ctc
Met Ser	Ser Ser Lys Asn Leu	Ala Gly Val Gly Val Asp Ser Leu
2510	2515	2520
gtc gcc 7614	att gaa ctt cga aac	tgg atc aca tct gaa atc cat gtt
Val Ala	Ile Glu Leu Arg Asn	Trp Ile Thr Ser Glu Ile His Val
2525	2530	2535
gat gtg 7659	tcg atc ttt gag ctc	atg aat ggt aac acc atc gcc ggc
Asp Val	Ser Ile Phe Glu Leu	Met Asn Gly Asn Thr Ile Ala Gly
2540	2545	2550



ctc gtc gag tta gtt gtg gcg aaa tgc agt taa

7692

Leu Val Glu Leu Val Val Ala Lys Cys Ser

2555

2560

<210> 46

<211> 2563

<212> PRT

<213> Penicillium citrinum

<400> 46

Met Asn Asn Thr Pro Ala Val Thr Ala Thr Ala Thr Ala Thr  
1 5 10 15

Ala Thr Ala Met Ala Gly Ser Ala Cys Ser Asn Thr Ser Thr Pro Ile  
20 25 30

Ala Ile Val Gly Met Gly Cys Arg Phe Ala Gly Asp Ala Thr Ser Pro  
35 40 45

Gln Lys Leu Trp Glu Met Val Glu Arg Gly Gly Ser Ala Trp Ser Lys  
50 55 60

Val Pro Ser Ser Arg Phe Asn Val Arg Gly Val Tyr His Pro Asn Gly  
65 70 75 80

Glu Arg Val Gly Ser Thr His Val Lys Gly Gly His Phe Ile Asp Glu  
85 90 95

Asp Pro Ala Leu Phe Asp Ala Ala Phe Phe Asn Met Thr Thr Glu Val  
100 105 110



Ala Ser Cys Met Asp Pro Gln Tyr Arg Leu Met Leu Glu Val Val Tyr  
115 120 125

Glu Ser Leu Glu Ser Ala Gly Ile Thr Ile Asp Gly Met Ala Gly Ser  
130 135 140

Asn Thr Ser Val Phe Gly Gly Val Met Tyr His Asp Tyr Gln Asp Ser  
145 150 155 160

Leu Asn Arg Asp Pro Glu Thr Val Pro Arg Tyr Phe Ile Thr Gly Asn  
165 170 175

Ser Gly Thr Met Leu Ser Asn Arg Ile Ser His Phe Tyr Asp Leu Arg  
180 185 190

Gly Pro Ser Val Thr Val Asp Thr Ala Cys Ser Thr Thr Leu Thr Ala  
195 200 205

Leu His Leu Ala Cys Gln Ser Leu Arg Thr Gly Glu Ser Asp Thr Ala  
210 215 220

Ile Val Ile Gly Ala Asn Leu Leu Leu Asn Pro Asp Val Phe Val Thr  
225 230 235 240

Met Ser Asn Leu Gly Phe Leu Ser Pro Asp Gly Ile Ser Tyr Ser Phe  
245 250 255

Asp Pro Arg Ala Asn Gly Tyr Gly Arg Gly Glu Gly Ile Ala Ala Leu  
260 265 270

Val Ile Lys Ala Leu Pro Asn Ala Leu Arg Asp Gln Asp Pro Ile Arg  
275 280 285

Ala Val Ile Arg Glu Thr Ala Leu Asn Gln Asp Gly Lys Thr Pro Ala  
290 295 300

Ile Thr Ala Pro Ser Asp Val Ala Gln Lys Ser Leu Ile Gln Glu Cys  
305 310 315 320



Tyr Asp Lys Ala Gly Leu Asp Met Ser Leu Thr Ser Tyr Val Glu Ala  
325 330 335

His Gly Thr Gly Thr Pro Thr Gly Asp Pro Leu Glu Ile Ser Ala Ile  
340 345 350

Ser Ala Ala Phe Lys Gly His Pro Leu His Leu Gly Ser Val Lys Ala  
355 360 365

Asn Ile Gly His Thr Glu Ala Ala Ser Gly Leu Ala Ser Ile Ile Lys  
370 375 380

Val Ala Leu Ala Leu Glu Lys Gly Leu Ile Pro Pro Asn Ala Arg Phe  
385 390 395 400

Leu Gln Lys Asn Ser Lys Leu Met Leu Asp Gln Lys Asn Ile Lys Ile  
405 410 415

Pro Met Ser Ala Gln Asp Trp Pro Val Lys Asp Gly Thr Arg Arg Ala  
420 425 430

Ser Val Asn Asn Phe Gly Phe Gly Gly Ser Asn Ala His Val Ile Leu  
435 440 445

Glu Ser Tyr Asp Arg Ala Ser Leu Ala Leu Pro Glu Asp Gln Val His  
450 455 460

Val Asn Gly Asn Ser Glu His Gly Arg Val Glu Asp Gly Ser Lys Gln  
465 470 475 480

Ser Arg Ile Tyr Val Val Arg Ala Lys Asp Glu Gln Ala Cys Arg Arg  
485 490 495

Thr Ile Ala Ser Leu Arg Asp Tyr Ile Lys Ser Val Ala Asp Ile Asp  
500 505 510

Gly Glu Pro Phe Leu Ala Ser Leu Ala Tyr Thr Leu Gly Ser Arg Arg



515						520						525			
Ser	Ile	Leu	Pro	Trp	Thr	Ser	Val	Tyr	Val	Ala	Asp	Ser	Leu	Gly	Gly
530						535					540				
Leu	Val	Ser	Ala	Leu	Ser	Asp	Glu	Ser	Asn	Gln	Pro	Lys	Arg	Ala	Asn
545					550					555					560
Glu	Lys	Val	Arg	Leu	Gly	Phe	Val	Phe	Thr	Gly	Gln	Gly	Ala	Gln	Trp
				565					570					575	
His	Ala	Met	Gly	Arg	Glu	Leu	Val	Asn	Thr	Phe	Pro	Val	Phe	Lys	Gln
			580					585					590		
Ala	Ile	Leu	Glu	Cys	Asp	Gly	Tyr	Ile	Lys	Gln	Leu	Gly	Ala	Ser	Trp
		595					600					605			
Asn	Phe	Met	Glu	Glu	Leu	His	Arg	Asp	Glu	Leu	Thr	Thr	Arg	Val	Asn
	610					615					620				
Asp	Ala	Glu	Tyr	Ser	Leu	Pro	Leu	Ser	Thr	Ala	Ile	Gln	Ile	Ala	Leu
625					630					635					640
Val	Arg	Leu	Leu	Trp	Ser	Trp	Gly	Ile	Arg	Pro	Thr	Gly	Ile	Thr	Ser
				645					650					655	
His	Ser	Ser	Gly	Glu	Ala	Ala	Ala	Ala	Tyr	Ala	Ala	Gly	Ala	Leu	Ser
			660					665					670		
Ala	Arg	Ser	Ala	Ile	Gly	Ile	Thr	Tyr	Ile	Arg	Gly	Val	Leu	Thr	Thr
		675					680					685			
Lys	Pro	Lys	Pro	Ala	Leu	Ala	Ala	Lys	Gly	Gly	Met	Met	Ala	Val	Gly
	690					695					700				
Leu	Gly	Arg	Ser	Glu	Thr	Asn	Val	Tyr	Ile	Ser	Arg	Leu	Asn	Gln	Glu
705					710					715					720



Asp Gly Cys Val Val Val Gly Cys Ile Asn Ser Gln Cys Ser Val Thr  
725 730 735

Val Ser Gly Asp Leu Gly Ala Ile Glu Lys Leu Glu Lys Leu Leu His  
740 745 750

Ala Asp Gly Ile Phe Thr Arg Lys Leu Lys Val Thr Glu Ala Phe His  
755 760 765

Ser Ser His Met Arg Pro Met Ala Asp Ala Phe Gly Ala Ser Leu Arg  
770 775 780

Asp Leu Phe Asn Ser Asp Asn Asn Asn Asp Asn Pro Asn Ala Asp Thr  
785 790 795 800

Ser Lys Gly Val Leu Tyr Ser Ser Pro Lys Thr Gly Ser Arg Met Thr  
805 810 815

Asp Leu Lys Leu Leu Leu Asp Pro Thr His Trp Met Asp Ser Met Leu  
820 825 830

Gln Pro Val Glu Phe Glu Ser Ser Leu Arg Glu Met Cys Phe Asp Pro  
835 840 845

Asn Thr Lys Glu Lys Ala Val Asp Val Ile Ile Glu Ile Gly Pro His  
850 855 860

Gly Ala Leu Gly Gly Pro Ile Asn Gln Val Met Gln Asp Leu Gly Leu  
865 870 875 880

Lys Gly Thr Asp Ile Asn Tyr Leu Ser Cys Leu Ser Arg Gly Arg Ser  
885 890 895

Ser Leu Glu Thr Met Tyr Arg Ala Ala Thr Glu Leu Ile Ser Lys Gly  
900 905 910

Tyr Gly Leu Lys Met Asp Ala Ile Asn Phe Pro His Gly Arg Lys Glu  
915 920 925



Pro Arg Val Lys Val Leu Ser Asp Leu Pro Ala Tyr Pro Trp Asn His  
930 935 940

Gln Thr Arg Tyr Trp Arg Glu Pro Arg Gly Ser Arg Glu Ser Lys Gln  
945 950 955 960

Arg Thr His Pro Pro His Thr Leu Ile Gly Ser Arg Glu Ser Leu Ser  
965 970 975

Pro His Phe Ala Pro Lys Trp Lys His Val Leu Arg Leu Ser Asp Ile  
980 985 990

Pro Trp Ile Arg Asp His Val Val Gly Ser Ser Ile Ile Phe Pro Gly  
995 1000 1005

Ala Gly Phe Ile Ser Met Ala Ile Glu Gly Phe Ser Gln Val Cys  
1010 1015 1020

Pro Pro Val Ala Gly Ala Ser Ile Asn Tyr Asn Leu Arg Asp Val  
1025 1030 1035

Glu Leu Ala Gln Ala Leu Ile Ile Pro Ala Asp Ala Glu Ala Glu  
1040 1045 1050

Val Asp Leu Arg Leu Thr Ile Arg Ser Cys Glu Glu Arg Ser Leu  
1055 1060 1065

Gly Thr Lys Asn Trp His Gln Phe Ser Val His Ser Ile Ser Gly  
1070 1075 1080

Glu Asn Asn Thr Trp Thr Glu His Cys Thr Gly Leu Ile Arg Ser  
1085 1090 1095

Glu Ser Glu Arg Ser His Leu Asp Cys Ser Thr Val Glu Ala Ser  
1100 1105 1110

Arg Arg Leu Asn Leu Gly Ser Asp Asn Arg Ser Ile Asp Pro Asn



1115	1120	1125
Asp Leu Trp Glu Ser Leu His 1130	Ala Asn Gly Ile Cys 1135	His Gly Pro 1140
Ile Phe Gln Asn Ile Gln Arg 1145	Ile Gln Asn Asn Gly 1150	Gln Gly Ser 1155
Phe Cys Arg Phe Ser Ile Ala 1160	Asp Thr Ala Ser Ala 1165	Met Pro His 1170
Ser Tyr Glu Asn Arg His Ile 1175	Val His Pro Thr Thr 1180	Leu Asp Ser 1185
Val Ile Gln Ala Ala Tyr Thr 1190	Val Leu Pro Tyr Ala 1195	Gly Thr Arg 1200
Met Lys Thr Ala Met Val Pro 1205	Arg Arg Leu Arg Asn 1210	Val Lys Ile 1215
Ser Ser Ser Leu Ala Asp Leu 1220	Glu Ala Gly Asp Ala 1225	Leu Asp Ala 1230
Gln Ala Ser Ile Lys Asp Arg 1235	Asn Ser Gln Ser Phe 1240	Ser Thr Asp 1245
Leu Ala Val Phe Asp Asp Tyr 1250	Asp Ser Gly Ser Ser 1255	Pro Ser Asp 1260
Gly Ile Pro Val Ile Glu Ile 1265	Glu Gly Leu Val Phe 1270	Gln Ser Val 1275
Gly Ser Ser Phe Ser Asp Gln 1280	Lys Ser Asp Ser Asn 1285	Asp Thr Glu 1290
Asn Ala Cys Ser Ser Trp Val 1295	Trp Ala Pro Asp Ile 1300	Ser Leu Gly 1305



Asp Ser Thr Trp Leu Lys Glu Lys Leu Ser Thr Glu Ala Glu Thr  
1310 1315 1320

Lys Glu Thr Glu Leu Met Met Asp Leu Arg Arg Cys Thr Ile Asn  
1325 1330 1335

Phe Ile Gln Glu Ala Val Thr Asp Leu Thr Asn Ser Asp Ile Gln  
1340 1345 1350

His Leu Asp Gly His Leu Gln Lys Tyr Phe Asp Trp Met Asn Val  
1355 1360 1365

Gln Leu Asp Leu Ala Arg Gln Asn Lys Leu Ser Pro Ala Ser Cys  
1370 1375 1380

Asp Trp Leu Ser Asp Asp Ala Glu Gln Lys Lys Cys Leu Gln Ala  
1385 1390 1395

Arg Val Ala Gly Glu Ser Val Asn Gly Glu Met Ile Ser Arg Leu  
1400 1405 1410

Gly Pro Gln Leu Ile Ala Met Leu Arg Arg Glu Thr Glu Pro Leu  
1415 1420 1425

Glu Leu Met Met Gln Asp Gln Leu Leu Ser Arg Tyr Tyr Val Asn  
1430 1435 1440

Ala Ile Lys Trp Ser Arg Ser Asn Ala Gln Ala Ser Glu Leu Ile  
1445 1450 1455

Arg Leu Cys Ala His Lys Asn Pro Arg Ser Arg Ile Leu Glu Ile  
1460 1465 1470

Gly Gly Gly Thr Gly Gly Cys Thr Lys Leu Ile Val Asn Ala Leu  
1475 1480 1485

Gly Asn Thr Lys Pro Ile Asp Arg Tyr Asp Phe Thr Asp Val Ser  
1490 1495 1500



Ala Gly Phe Phe Glu Ser Ala Arg Glu Gln Phe Ala Asp Trp Gln  
1505 1510 1515

Asp Val Met Thr Phe Lys Lys Leu Asp Ile Glu Ser Asp Pro Glu  
1520 1525 1530

Gln Gln Gly Phe Glu Cys Ala Thr Tyr Asp Val Val Val Ala Cys  
1535 1540 1545

Gln Val Leu His Ala Thr Arg Cys Met Lys Arg Thr Leu Ser Asn  
1550 1555 1560

Val Arg Lys Leu Leu Lys Pro Gly Gly Asn Leu Ile Leu Val Glu  
1565 1570 1575

Thr Thr Arg Asp Gln Leu Asp Leu Phe Phe Thr Phe Gly Leu Leu  
1580 1585 1590

Pro Gly Trp Trp Leu Ser Glu Glu Pro Glu Arg Lys Ser Thr Pro  
1595 1600 1605

Ser Leu Thr Thr Asp Leu Trp Asn Thr Met Leu Asp Thr Ser Gly  
1610 1615 1620

Phe Asn Gly Val Glu Leu Glu Val Arg Asp Cys Glu Asp Asp Glu  
1625 1630 1635

Phe Tyr Met Ile Ser Thr Met Leu Ser Thr Ala Arg Lys Glu Asn  
1640 1645 1650

Thr Thr Pro Asp Thr Val Ala Glu Ser Glu Val Leu Leu Leu His  
1655 1660 1665

Gly Ala Leu Arg Pro Pro Ser Ser Trp Leu Glu Ser Leu Gln Ala  
1670 1675 1680

Ala Ile Cys Glu Lys Thr Ser Ser Ser Pro Ser Ile Asn Ala Leu



1685						1690					1695			
Gly	Glu	Val	Asp	Thr	Thr	Gly	Arg	Thr	Cys	Ile	Phe	Leu	Gly	Glu
1700						1705					1710			
Met	Glu	Ser	Ser	Leu	Leu	Gly	Glu	Val	Gly	Ser	Glu	Thr	Phe	Lys
1715						1720					1725			
Ser	Ile	Thr	Ala	Met	Leu	Asn	Asn	Cys	Asn	Ala	Leu	Leu	Trp	Val
1730						1735					1740			
Ser	Arg	Gly	Ala	Ala	Met	Ser	Ser	Glu	Asp	Pro	Trp	Lys	Ala	Leu
1745						1750					1755			
His	Ile	Gly	Leu	Leu	Arg	Thr	Ile	Arg	Asn	Glu	Asn	Asn	Gly	Lys
1760						1765					1770			
Glu	Tyr	Val	Ser	Leu	Asp	Leu	Asp	Pro	Ser	Arg	Asn	Ala	Tyr	Thr
1775						1780					1785			
His	Glu	Ser	Leu	Tyr	Ala	Ile	Cys	Asn	Ile	Phe	Asn	Gly	Arg	Leu
1790						1795					1800			
Gly	Asp	Leu	Ser	Glu	Asp	Lys	Glu	Phe	Glu	Phe	Ala	Glu	Arg	Asn
1805						1810					1815			
Gly	Val	Ile	His	Val	Pro	Arg	Leu	Phe	Asn	Asp	Pro	His	Trp	Lys
1820						1825					1830			
Asp	Gln	Glu	Ala	Val	Glu	Val	Thr	Leu	Gln	Pro	Phe	Glu	Gln	Pro
1835						1840					1845			
Gly	Arg	Arg	Leu	Arg	Met	Glu	Val	Glu	Thr	Pro	Gly	Leu	Leu	Asp
1850						1855					1860			
Ser	Leu	Gln	Phe	Arg	Asp	Asp	Glu	Gly	Arg	Glu	Gly	Lys	Asp	Leu
1865						1870					1875			



Pro Asp Asp Trp Val Glu Ile Glu Pro Lys Ala Phe Gly Leu Asn  
1880 1885 1890

Phe Arg Asp Val Met Val Ala Met Gly Gln Leu Glu Ala Asn Arg  
1895 1900 1905

Val Met Gly Phe Glu Cys Ala Gly Val Ile Thr Lys Leu Gly Gly  
1910 1915 1920

Ala Ala Ala Ala Ser Gln Gly Leu Arg Leu Gly Asp Arg Val Cys  
1925 1930 1935

Ala Leu Leu Lys Gly His Trp Ala Thr Arg Thr Gln Thr Pro Tyr  
1940 1945 1950

Thr Asn Val Val Arg Ile Pro Asp Glu Met Gly Phe Pro Glu Ala  
1955 1960 1965

Ala Ser Val Pro Leu Ala Phe Thr Thr Ala Tyr Ile Ala Leu Tyr  
1970 1975 1980

Thr Thr Ala Lys Leu Arg Arg Gly Glu Arg Val Leu Ile His Ser  
1985 1990 1995

Gly Ala Gly Gly Val Gly Gln Ala Ala Ile Ile Leu Ser Gln Leu  
2000 2005 2010

Ala Gly Ala Glu Val Phe Val Thr Ala Gly Thr Gln Ala Lys Arg  
2015 2020 2025

Asp Phe Val Gly Asp Lys Phe Gly Ile Asn Pro Asp His Ile Phe  
2030 2035 2040

Ser Ser Arg Asn Asp Leu Phe Val Asp Gly Ile Lys Ala Tyr Thr  
2045 2050 2055

Gly Gly Leu Gly Val His Val Val Leu Asn Ser Leu Ala Gly Gln  
2060 2065 2070



Leu Leu Gln Ala Ser Phe Asp Cys Met Ala Glu Phe Gly Arg Phe  
2075 2080 2085

Val Glu Ile Gly Lys Lys Asp Leu Glu Gln Asn Ser Arg Leu Asp  
2090 2095 2100

Met Leu Pro Phe Thr Arg Asp Val Ser Phe Thr Ser Ile Asp Leu  
2105 2110 2115

Leu Ser Trp Gln Arg Ala Lys Ser Glu Glu Val Ser Glu Ala Leu  
2120 2125 2130

Asn His Val Thr Lys Leu Leu Glu Thr Lys Ala Ile Gly Leu Ile  
2135 2140 2145

Gly Pro Ile Gln Gln His Ser Leu Ser Asn Ile Glu Lys Ala Phe  
2150 2155 2160

Arg Thr Met Gln Ser Gly Gln His Val Gly Lys Val Val Val Asn  
2165 2170 2175

Val Ser Gly Asp Glu Leu Val Pro Val Gly Asp Gly Gly Phe Ser  
2180 2185 2190

Leu Lys Leu Lys Pro Asp Ser Ser Tyr Leu Val Ala Gly Gly Leu  
2195 2200 2205

Gly Gly Ile Gly Lys Gln Ile Cys Gln Trp Leu Val Asp His Gly  
2210 2215 2220

Ala Lys His Leu Ile Ile Leu Ser Arg Ser Ala Lys Ala Ser Pro  
2225 2230 2235

Phe Ile Thr Ser Leu Gln Asn Gln Gln Cys Ala Val Tyr Leu His  
2240 2245 2250

Ala Cys Asp Ile Ser Asp Gln Asp Gln Val Thr Lys Val Leu Arg



2255						2260					2265			
Leu	Cys	Glu	Glu	Ala	His	Ala	Pro	Pro	Ile	Arg	Gly	Ile	Ile	Gln
2270						2275					2280			
Gly	Ala	Met	Val	Leu	Lys	Asp	Ala	Leu	Leu	Ser	Arg	Met	Thr	Leu
2285						2290					2295			
Asp	Glu	Phe	Asn	Ala	Ala	Thr	Arg	Pro	Lys	Val	Gln	Gly	Ser	Trp
2300						2305					2310			
Tyr	Leu	His	Lys	Ile	Ala	Gln	Asp	Val	Asp	Phe	Phe	Val	Met	Leu
2315						2320					2325			
Ser	Ser	Leu	Val	Gly	Val	Met	Gly	Gly	Ala	Gly	Gln	Ala	Asn	Tyr
2330						2335					2340			
Ala	Ala	Ala	Gly	Ala	Phe	Gln	Asp	Ala	Leu	Ala	His	His	Arg	Arg
2345						2350					2355			
Ala	His	Gly	Met	Pro	Ala	Val	Thr	Ile	Asp	Leu	Gly	Met	Val	Lys
2360						2365					2370			
Ser	Val	Gly	Tyr	Val	Ala	Glu	Thr	Gly	Arg	Gly	Val	Ala	Asp	Arg
2375						2380					2385			
Leu	Ala	Arg	Ile	Gly	Tyr	Lys	Pro	Met	His	Glu	Lys	Asp	Val	Met
2390						2395					2400			
Asp	Val	Leu	Glu	Lys	Ala	Ile	Leu	Cys	Ser	Ser	Pro	Gln	Phe	Pro
2405						2410					2415			
Ser	Pro	Pro	Ala	Ala	Val	Val	Thr	Gly	Ile	Asn	Thr	Ser	Pro	Gly
2420						2425					2430			
Ala	His	Trp	Thr	Glu	Ala	Asn	Trp	Ile	Gln	Glu	Gln	Arg	Phe	Val
2435						2440					2445			



Gly Leu Lys Tyr Arg Gln Val Leu His Ala Asp Gln Ser Phe Val  
2450 2455 2460

Ser Ser His Lys Lys Gly Pro Asp Gly Val Arg Ala Gln Leu Ser  
2465 2470 2475

Arg Val Thr Ser His Asp Glu Ala Ile Ser Ile Val Leu Lys Ala  
2480 2485 2490

Met Thr Glu Lys Leu Met Arg Met Phe Gly Leu Ala Glu Asp Asp  
2495 2500 2505

Met Ser Ser Ser Lys Asn Leu Ala Gly Val Gly Val Asp Ser Leu  
2510 2515 2520

Val Ala Ile Glu Leu Arg Asn Trp Ile Thr Ser Glu Ile His Val  
2525 2530 2535

Asp Val Ser Ile Phe Glu Leu Met Asn Gly Asn Thr Ile Ala Gly  
2540 2545 2550

Leu Val Glu Leu Val Val Ala Lys Cys Ser  
2555 2560

<210> 47

<211> 1557

<212> DNA

<213> Penicillium citrinum

<220>

<221> CDS

<222> (1)..(1557)



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1           5           10           15

acc cct caa gcc ctt gtg gcg gtc gca gtg ctt ctt agt ctc atc gcc
 96
Thr Pro Gln Ala Leu Val Ala Val Ala Val Leu Leu Ser Leu Ile Ala
           20           25           30

tac cgt ttg cgg ggg cgc cag tcc gaa ctg caa gtc tat aat ccc aaa
144
Tyr Arg Leu Arg Gly Arg Gln Ser Glu Leu Gln Val Tyr Asn Pro Lys
           35           40           45

aaa tgg tgg gag ttg acg acc atg agg gct agg cag gac ttc gat acg
192
Lys Trp Trp Glu Leu Thr Thr Met Arg Ala Arg Gln Asp Phe Asp Thr
           50           55           60

tat ggt ccg agc tgg atc gaa gct tgg ttc tcg aaa aac gac aag ccc
240
Tyr Gly Pro Ser Trp Ile Glu Ala Trp Phe Ser Lys Asn Asp Lys Pro
65           70           75           80

ctg cgc ttc att gtt gat tcc ggc tat tgc acc atc ctc cca tcg tcc
288
Leu Arg Phe Ile Val Asp Ser Gly Tyr Cys Thr Ile Leu Pro Ser Ser
           85           90           95

atg gcc gac gag ttt cgg aaa atc aaa gat atg tgc atg tac aag ttt
336
Met Ala Asp Glu Phe Arg Lys Ile Lys Asp Met Cys Met Tyr Lys Phe
           100           105           110

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ttg gcg gat gac ttt cac tct cat ctc cct gga ttc gac ggg ttc aag  
384  
Leu Ala Asp Asp Phe His Ser His Leu Pro Gly Phe Asp Gly Phe Lys

115

120

125

gaa atc tgc cag gat gca cat ctt gtc aac aaa gtt gtt ttg aac cag  
432  
Glu Ile Cys Gln Asp Ala His Leu Val Asn Lys Val Val Leu Asn Gln

130

135

140

tta caa acc caa gcc ccc aag tac aca aag cca ttg gct acc ttg gcc  
480  
Leu Gln Thr Gln Ala Pro Lys Tyr Thr Lys Pro Leu Ala Thr Leu Ala

145

150

155

160

gac gct act att gcc aag ttg ttc ggt aaa agc gag gag tgg caa acc  
528  
Asp Ala Thr Ile Ala Lys Leu Phe Gly Lys Ser Glu Glu Trp Gln Thr

165

170

175

gca cct gtc tat tcc aat gga ttg gac ctt gtc aca cga aca gtc aca  
576  
Ala Pro Val Tyr Ser Asn Gly Leu Asp Leu Val Thr Arg Thr Val Thr

180

185

190

ctc att atg gtc ggc gac aaa atc tgc cac aat gag gag tgg ctg gat  
624  
Leu Ile Met Val Gly Asp Lys Ile Cys His Asn Glu Glu Trp Leu Asp

195

200

205

att gca aag aac cat gcc gtg agt gtg gcg gta caa gct cgc caa ctt  
672  
Ile Ala Lys Asn His Ala Val Ser Val Ala Val Gln Ala Arg Gln Leu

210

215

220

cgc gta tgg ccc atg cta ctg cga ccg ctc gct cac tgg ttt caa ccg



720  
 Arg Val Trp Pro Met Leu Leu Arg Pro Leu Ala His Trp Phe Gln Pro  
 225 230 235 240  
 caa gga cgc aaa ttg cgt gac caa gtg cgc cgc gca cga aag atc att  
 768  
 Gln Gly Arg Lys Leu Arg Asp Gln Val Arg Arg Ala Arg Lys Ile Ile  
 245 250 255  
 gat cct gag att cag cga cga cgt gct gaa aag gcc gca tgt gta gcg  
 816  
 Asp Pro Glu Ile Gln Arg Arg Arg Ala Glu Lys Ala Ala Cys Val Ala  
 260 265 270  
 aag ggc gtg cag ccg ccc cag tac gtc gat acc atg caa tgg ttt gaa  
 864  
 Lys Gly Val Gln Pro Pro Gln Tyr Val Asp Thr Met Gln Trp Phe Glu  
 275 280 285  
 gac acc gcc gac ggc cgc tgg tac gat gtg gcg ggt gct cag ctc gct  
 912  
 Asp Thr Ala Asp Gly Arg Trp Tyr Asp Val Ala Gly Ala Gln Leu Ala  
 290 295 300  
 atg gat ttc gcc ggc atc tac gcc tcg acg gat ctt ttc gtc ggt gcc  
 960  
 Met Asp Phe Ala Gly Ile Tyr Ala Ser Thr Asp Leu Phe Val Gly Ala  
 305 310 315 320  
 ctt gtg gac att gcc agg cac cca gac ctt att cag cct ctc cgc caa  
 1008  
 Leu Val Asp Ile Ala Arg His Pro Asp Leu Ile Gln Pro Leu Arg Gln  
 325 330 335  
 gag atc cgc act gta atc gga gaa ggg ggc tgg acg cct gcc tct ctg  
 1056



Glu Ile Arg Thr Val Ile Gly Glu Gly Gly Trp Thr Pro Ala Ser Leu

340

345

350

ttc aag ctg aag ctc ctc gac agc tgc atg aaa gag acg cag cga atc

1104

Phe Lys Leu Lys Leu Leu Asp Ser Cys Met Lys Glu Thr Gln Arg Ile

355

360

365

aag ccg gtc gag tgc gcc act atg cgc agt acc gct ctc aga gac atc

1152

Lys Pro Val Glu Cys Ala Thr Met Arg Ser Thr Ala Leu Arg Asp Ile

370

375

380

act cta tcc aat ggc ctc ttc att ccc aag ggc gag ttg gcc gct gtg

1200

Thr Leu Ser Asn Gly Leu Phe Ile Pro Lys Gly Glu Leu Ala Ala Val

385

390

395

400

gct gca gac cgc atg aac aac cct gat gtg tgg gaa aac ccc gaa aat

1248

Ala Ala Asp Arg Met Asn Asn Pro Asp Val Trp Glu Asn Pro Glu Asn

405

410

415

tat gat ccc tac cga ttt atg cgc atg cgc gag gat cca gac aag gcc

1296

Tyr Asp Pro Tyr Arg Phe Met Arg Met Arg Glu Asp Pro Asp Lys Ala

420

425

430

ttc acc gct caa ttg gag aat acc aac ggt gat cac atc ggc ttc ggc

1344

Phe Thr Ala Gln Leu Glu Asn Thr Asn Gly Asp His Ile Gly Phe Gly

435

440

445

tgg aac cca cgc gct tgt ccc ggg cgg ttc ttc gcc tcg aag gaa atc

1392

Trp Asn Pro Arg Ala Cys Pro Gly Arg Phe Phe Ala Ser Lys Glu Ile



450 455 460

aag att ctc ctc gct cat ata ctg att cag tat gat gtg aag cct gta  
 1440  
 Lys Ile Leu Leu Ala His Ile Leu Ile Gln Tyr Asp Val Lys Pro Val

465 470 475 480

cca gga gac gat gac aaa tac tac cgt cac gct ttt agc gtt cgt atg  
 1488  
 Pro Gly Asp Asp Asp Lys Tyr Tyr Arg His Ala Phe Ser Val Arg Met

485 490 495

cat cca acc aca aag ctc atg gta cgc cgg cgc aac gag gac atc ccg  
 1536  
 His Pro Thr Thr Lys Leu Met Val Arg Arg Arg Asn Glu Asp Ile Pro

500 505 510

ctc cct cat gac cgg tgc taa  
 1557  
 Leu Pro His Asp Arg Cys

515

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 <211> 518  
 <212> PRT  
 <213> Penicillium citrinum

<400> 48

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Thr Pro Gln Ala Leu Val Ala Val Ala Val Leu Leu Ser Leu Ile Ala



20							25					30				
Tyr	Arg	Leu	Arg	Gly	Arg	Gln	Ser	Glu	Leu	Gln	Val	Tyr	Asn	Pro	Lys	
		35					40					45				
Lys	Trp	Trp	Glu	Leu	Thr	Thr	Met	Arg	Ala	Arg	Gln	Asp	Phe	Asp	Thr	
	50					55					60					
Tyr	Gly	Pro	Ser	Trp	Ile	Glu	Ala	Trp	Phe	Ser	Lys	Asn	Asp	Lys	Pro	
65					70					75					80	
Leu	Arg	Phe	Ile	Val	Asp	Ser	Gly	Tyr	Cys	Thr	Ile	Leu	Pro	Ser	Ser	
				85					90					95		
Met	Ala	Asp	Glu	Phe	Arg	Lys	Ile	Lys	Asp	Met	Cys	Met	Tyr	Lys	Phe	
			100					105					110			
Leu	Ala	Asp	Asp	Phe	His	Ser	His	Leu	Pro	Gly	Phe	Asp	Gly	Phe	Lys	
		115					120					125				
Glu	Ile	Cys	Gln	Asp	Ala	His	Leu	Val	Asn	Lys	Val	Val	Leu	Asn	Gln	
	130					135					140					
Leu	Gln	Thr	Gln	Ala	Pro	Lys	Tyr	Thr	Lys	Pro	Leu	Ala	Thr	Leu	Ala	
145					150					155					160	
Asp	Ala	Thr	Ile	Ala	Lys	Leu	Phe	Gly	Lys	Ser	Glu	Glu	Trp	Gln	Thr	
				165					170					175		
Ala	Pro	Val	Tyr	Ser	Asn	Gly	Leu	Asp	Leu	Val	Thr	Arg	Thr	Val	Thr	
			180					185					190			
Leu	Ile	Met	Val	Gly	Asp	Lys	Ile	Cys	His	Asn	Glu	Glu	Trp	Leu	Asp	
		195					200					205				
Ile	Ala	Lys	Asn	His	Ala	Val	Ser	Val	Ala	Val	Gln	Ala	Arg	Gln	Leu	
	210					215					220					



Arg Val Trp Pro Met Leu Leu Arg Pro Leu Ala His Trp Phe Gln Pro  
225 230 235 240

Gln Gly Arg Lys Leu Arg Asp Gln Val Arg Arg Ala Arg Lys Ile Ile  
245 250 255

Asp Pro Glu Ile Gln Arg Arg Arg Ala Glu Lys Ala Ala Cys Val Ala  
260 265 270

Lys Gly Val Gln Pro Pro Gln Tyr Val Asp Thr Met Gln Trp Phe Glu  
275 280 285

Asp Thr Ala Asp Gly Arg Trp Tyr Asp Val Ala Gly Ala Gln Leu Ala  
290 295 300

Met Asp Phe Ala Gly Ile Tyr Ala Ser Thr Asp Leu Phe Val Gly Ala  
305 310 315 320

Leu Val Asp Ile Ala Arg His Pro Asp Leu Ile Gln Pro Leu Arg Gln  
325 330 335

Glu Ile Arg Thr Val Ile Gly Glu Gly Gly Trp Thr Pro Ala Ser Leu  
340 345 350

Phe Lys Leu Lys Leu Leu Asp Ser Cys Met Lys Glu Thr Gln Arg Ile  
355 360 365

Lys Pro Val Glu Cys Ala Thr Met Arg Ser Thr Ala Leu Arg Asp Ile  
370 375 380

Thr Leu Ser Asn Gly Leu Phe Ile Pro Lys Gly Glu Leu Ala Ala Val  
385 390 395 400

Ala Ala Asp Arg Met Asn Asn Pro Asp Val Trp Glu Asn Pro Glu Asn  
405 410 415

Tyr Asp Pro Tyr Arg Phe Met Arg Met Arg Glu Asp Pro Asp Lys Ala  
420 425 430



Phe Thr Ala Gln Leu Glu Asn Thr Asn Gly Asp His Ile Gly Phe Gly  
435 440 445

Trp Asn Pro Arg Ala Cys Pro Gly Arg Phe Phe Ala Ser Lys Glu Ile  
450 455 460

Lys Ile Leu Leu Ala His Ile Leu Ile Gln Tyr Asp Val Lys Pro Val  
465 470 475 480

Pro Gly Asp Asp Asp Lys Tyr Tyr Arg His Ala Phe Ser Val Arg Met  
485 490 495

His Pro Thr Thr Lys Leu Met Val Arg Arg Arg Asn Glu Asp Ile Pro  
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Leu Pro His Asp Arg Cys  
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<212> DNA

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<220>

<221> CDS

<222> (1)..(3522)

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Met Val Ala Ser Leu Leu Pro Ser Arg Phe Arg Gly Arg Glu Ser Met

1

5

10

15



aat cag cag cac cct cta cgc tcg gga aat cgg gca ttg acc tcc aca  
96  
Asn Gln Gln His Pro Leu Arg Ser Gly Asn Arg Ala Leu Thr Ser Thr

20

25

30

ctc caa ttt cta tcc aaa acg gcg tgt cta cac ccg atc cat acc gtt  
144  
Leu Gln Phe Leu Ser Lys Thr Ala Cys Leu His Pro Ile His Thr Val

35

40

45

tgc acc ata gct att cta gct agt acc aca tac gtt gga cta ctc aaa  
192  
Cys Thr Ile Ala Ile Leu Ala Ser Thr Thr Tyr Val Gly Leu Leu Lys

50

55

60

gac agc ttc ttc cat ggc ccc gca aac gtt gat aaa gca gaa tgg ggc  
240  
Asp Ser Phe Phe His Gly Pro Ala Asn Val Asp Lys Ala Glu Trp Gly

65

70

75

80

tct ttg gtc gaa gga agt cga agc ttg atc acc ggc cca cag aat ggc  
288  
Ser Leu Val Glu Gly Ser Arg Ser Leu Ile Thr Gly Pro Gln Asn Gly

85

90

95

tgg aag tgg cag agc ttc gac ggg gat gca gat gtt ctc gga gat ttc  
336  
Trp Lys Trp Gln Ser Phe Asp Gly Asp Ala Asp Val Leu Gly Asp Phe

100

105

110

aac cat caa gca cta atg acc ttg gta ttc ccg ggg tca tat ggg gtt  
384  
Asn His Gln Ala Leu Met Thr Leu Val Phe Pro Gly Ser Tyr Gly Val

115

120

125

gca tct caa gca gcc tca cca ttc ctt gct ccc ctc cct gtg aac cta



432  
 Ala Ser Gln Ala Ala Ser Pro Phe Leu Ala Pro Leu Pro Val Asn Leu  
 130 135 140  
 tct gtg att gac ctt ccc tca acg tcg agc cct tta acc gcc tat tcg  
 480  
 Ser Val Ile Asp Leu Pro Ser Thr Ser Ser Pro Leu Thr Ala Tyr Ser  
 145 150 155 160  
 aaa gat aaa gtt ttc gcc ttc tct gtg gaa tac agc agc gcg ccg gaa  
 528  
 Lys Asp Lys Val Phe Ala Phe Ser Val Glu Tyr Ser Ser Ala Pro Glu  
 165 170 175  
 ctc gtg gct gct gtt caa gaa atc ccc aac aac agt gcc gac ctg aaa  
 576  
 Leu Val Ala Ala Val Gln Glu Ile Pro Asn Asn Ser Ala Asp Leu Lys  
 180 185 190  
 ttg cag gag acg caa ttg atc gag atg gaa cgc cag atg tgg atc atg  
 624  
 Leu Gln Glu Thr Gln Leu Ile Glu Met Glu Arg Gln Met Trp Ile Met  
 195 200 205  
 aag gct gcc agg gct cac aca aaa cgc agc ctt gct caa tgg gtg cac  
 672  
 Lys Ala Ala Arg Ala His Thr Lys Arg Ser Leu Ala Gln Trp Val His  
 210 215 220  
 gat acc tgg aca gag tct ctt gat ctt atc aag agc gct caa acg ctc  
 720  
 Asp Thr Trp Thr Glu Ser Leu Asp Leu Ile Lys Ser Ala Gln Thr Leu  
 225 230 235 240  
 gac gtg gtt gtc atg gtg cta ggt tat ata tca atg cac ttg act ttc  
 768



Asp Val Val Val Met Val Leu Gly Tyr Ile Ser Met His Leu Thr Phe  
245 250 255

gtc tca ctc ttc ctc agc atg aaa aaa ttg gga tcg aag gtt tgg ctg  
816  
Val Ser Leu Phe Leu Ser Met Lys Lys Leu Gly Ser Lys Val Trp Leu  
260 265 270

gct aca agc gtc ctt ttg tcg tca aca ttt gcc ttt ctc ctc ggt ctc  
864  
Ala Thr Ser Val Leu Leu Ser Ser Thr Phe Ala Phe Leu Leu Gly Leu  
275 280 285

gac gtg gcc ata aga cta ggg gtt ccg atg agc atg agg ttg cta tcc  
912  
Asp Val Ala Ile Arg Leu Gly Val Pro Met Ser Met Arg Leu Leu Ser  
290 295 300

gaa ggc ctc ccc ttc ttg gtg gtg atc gtt ggc ttt gag aag agc atc  
960  
Glu Gly Leu Pro Phe Leu Val Val Ile Val Gly Phe Glu Lys Ser Ile  
305 310 315 320

act ctg acc agg gct gtt ttg tcc tat gct gtg cag cac cga aag ccc  
1008  
Thr Leu Thr Arg Ala Val Leu Ser Tyr Ala Val Gln His Arg Lys Pro  
325 330 335

cag aag ata cag tct gac cag ggt agc gtg aca gcc att gct gaa agt  
1056  
Gln Lys Ile Gln Ser Asp Gln Gly Ser Val Thr Ala Ile Ala Glu Ser  
340 345 350

acc atc aat tac gcc gta cga agc gcc att cgg gag aag ggt tac aat  
1104  
Thr Ile Asn Tyr Ala Val Arg Ser Ala Ile Arg Glu Lys Gly Tyr Asn



355	360	365
atc gtg tgc cac tac gtg gtc gag atc ctg ctc cta gtt atc ggt gct		
1152		
Ile Val Cys His Tyr Val Val Glu Ile Leu Leu Leu Val Ile Gly Ala		
370	375	380
gtc tta ggc atc caa ggt ggg cta cag cac ttc tgt gtt cta gct gca		
1200		
Val Leu Gly Ile Gln Gly Gly Leu Gln His Phe Cys Val Leu Ala Ala		
385	390	395
400		
ttg atc ctg ttc ttt gac tgt ctg ctg ctg ttt aca ttc tac act gcg		
1248		
Leu Ile Leu Phe Phe Asp Cys Leu Leu Leu Phe Thr Phe Tyr Thr Ala		
405	410	415
att ctg tct atc aag ctc gag gta aac cgc ctc aaa cgt cat atc aac		
1296		
Ile Leu Ser Ile Lys Leu Glu Val Asn Arg Leu Lys Arg His Ile Asn		
420	425	430
atg cgg tac gcg ttg gaa gat gag ggt ctc agt cag cgg acg gcg gag		
1344		
Met Arg Tyr Ala Leu Glu Asp Glu Gly Leu Ser Gln Arg Thr Ala Glu		
435	440	445
agt gtc gcg acc agc aat gat gcc caa gac agt gca cgt aca tat ctg		
1392		
Ser Val Ala Thr Ser Asn Asp Ala Gln Asp Ser Ala Arg Thr Tyr Leu		
450	455	460
ttt ggc aat gat atg aaa ggc agc agt gtt ccg aag ttc aaa ttc tgg		
1440		
Phe Gly Asn Asp Met Lys Gly Ser Ser Val Pro Lys Phe Lys Phe Trp		



465		470		475		480
atg gtc gtt ggt ttc ctt atc gtc aac ctc gtc aac atc ggc tcc acc						
1488						
Met Val Val Gly Phe Leu Ile Val Asn Leu Val Asn Ile Gly Ser Thr						
		485		490		495
ctt ttc caa gcc tct tct agt gga tcg ttg tcc agt ata tca tct tgg						
1536						
Leu Phe Gln Ala Ser Ser Ser Gly Ser Leu Ser Ser Ile Ser Ser Trp						
		500		505		510
acc gaa agt ctg agc gga tcg gcc att aaa ccc ccg ctt gag ccc ttc						
1584						
Thr Glu Ser Leu Ser Gly Ser Ala Ile Lys Pro Pro Leu Glu Pro Phe						
		515		520		525
aag gta gct gga agt gga cta gat gaa cta ctt ttc cag gca aga ggg						
1632						
Lys Val Ala Gly Ser Gly Leu Asp Glu Leu Leu Phe Gln Ala Arg Gly						
		530		535		540
cgc ggt caa tcg act atg gtc act gtc ctc gcc ccc atc aag tac gaa						
1680						
Arg Gly Gln Ser Thr Met Val Thr Val Leu Ala Pro Ile Lys Tyr Glu						
545		550		555		560
cta gag tat cct tcc att cac cgt ggt acc tcg cag cta cac gag tat						
1728						
Leu Glu Tyr Pro Ser Ile His Arg Gly Thr Ser Gln Leu His Glu Tyr						
		565		570		575
gga gtt ggt gga aaa atg gtc ggt agc ctg ctc acc agc ctg gaa gat						
1776						
Gly Val Gly Gly Lys Met Val Gly Ser Leu Leu Thr Ser Leu Glu Asp						
		580		585		590



ccc gtc ctc tcc aaa tgg gtg ttt gtg gca ctt gcc cta agt gtc gct  
1824

Pro Val Leu Ser Lys Trp Val Phe Val Ala Leu Ala Leu Ser Val Ala

595

600

605

ctg aac agc tat ctg ttc aag gcc gcc aga ctg gga atc aaa gat cct  
1872

Leu Asn Ser Tyr Leu Phe Lys Ala Ala Arg Leu Gly Ile Lys Asp Pro

610

615

620

aat ctc ccg agt cac cca gtt gat cca gtt gag ctt gac cag gcc gaa  
1920

Asn Leu Pro Ser His Pro Val Asp Pro Val Glu Leu Asp Gln Ala Glu

625

630

635

640

agc ttc aac gct gcc cag aac cag acc cct cag att caa tca agt ctc  
1968

Ser Phe Asn Ala Ala Gln Asn Gln Thr Pro Gln Ile Gln Ser Ser Leu

645

650

655

caa gct cct cag acc aga gtg ttc act cct acc acc acc gac agt gac  
2016

Gln Ala Pro Gln Thr Arg Val Phe Thr Pro Thr Thr Thr Asp Ser Asp

660

665

670

agt gat gcc tca tta gtc tta att aaa gca tct cta aag gtc act aag  
2064

Ser Asp Ala Ser Leu Val Leu Ile Lys Ala Ser Leu Lys Val Thr Lys

675

680

685

cga gca gaa gga aag aca gcc act agt gaa ctt ccc gtg tct cgc aca  
2112

Arg Ala Glu Gly Lys Thr Ala Thr Ser Glu Leu Pro Val Ser Arg Thr

690

695

700



caa atc gaa ctg gac aat ttg ctg aag cag aac aca atc agc gag ttg  
2160

Gln Ile Glu Leu Asp Asn Leu Leu Lys Gln Asn Thr Ile Ser Glu Leu

705

710

715

720

aac gat gag gat gtc gtt gcc ttg tct ttg cgg gga aag gtt ccc ggg  
2208

Asn Asp Glu Asp Val Val Ala Leu Ser Leu Arg Gly Lys Val Pro Gly

725

730

735

tat gcc cta gag aag agt ctc aaa gac tgc act cgt gcc gtc aag gtt  
2256

Tyr Ala Leu Glu Lys Ser Leu Lys Asp Cys Thr Arg Ala Val Lys Val

740

745

750

cgc cgc tct atc att tcg agg aca ccg gct acc gca gag ctt aca agt  
2304

Arg Arg Ser Ile Ile Ser Arg Thr Pro Ala Thr Ala Glu Leu Thr Ser

755

760

765

atg ctg gag cac tcg aag ctg ccg tac gaa aac tac gcc tgg gaa cgc  
2352

Met Leu Glu His Ser Lys Leu Pro Tyr Glu Asn Tyr Ala Trp Glu Arg

770

775

780

gtg ctc ggt gca tgt tgc gag aac gtt att ggc tat atg cca gtc cct  
2400

Val Leu Gly Ala Cys Cys Glu Asn Val Ile Gly Tyr Met Pro Val Pro

785

790

795

800

gtt ggc gtc gcc ggt cct att gtt atc gac ggc aag agt tat ttc att  
2448

Val Gly Val Ala Gly Pro Ile Val Ile Asp Gly Lys Ser Tyr Phe Ile

805

810

815

cct atg gca acc acc gag ggc gtc ctc gtc gct agt gct agc cgt ggc



2496  
Pro Met Ala Thr Thr Glu Gly Val Leu Val Ala Ser Ala Ser Arg Gly  
820 825 830

agt aag gca atc aac ctc ggt ggc ggt gcc gtg aca gtc ctg act ggc  
2544  
Ser Lys Ala Ile Asn Leu Gly Gly Gly Ala Val Thr Val Leu Thr Gly  
835 840 845

gac ggt atg aca cga ggc ccg tgt gtg aag ttt gat gtc ctt gaa cga  
2592  
Asp Gly Met Thr Arg Gly Pro Cys Val Lys Phe Asp Val Leu Glu Arg  
850 855 860

gct ggt gct gct aag atc tgg ctc gat tcg gac gtc ggc cag acc gta  
2640  
Ala Gly Ala Ala Lys Ile Trp Leu Asp Ser Asp Val Gly Gln Thr Val  
865 870 875 880

atg aaa gaa gcc ttc aat tca acc agc aga ttt gcg cgc tta caa agt  
2688  
Met Lys Glu Ala Phe Asn Ser Thr Ser Arg Phe Ala Arg Leu Gln Ser  
885 890 895

atg cgg aca act atc gcc ggt act cac tta tat att cga ttt aag act  
2736  
Met Arg Thr Thr Ile Ala Gly Thr His Leu Tyr Ile Arg Phe Lys Thr  
900 905 910

act act ggc gac gct atg gga atg aat atg att tct aag ggc gtg gag  
2784  
Thr Thr Gly Asp Ala Met Gly Met Asn Met Ile Ser Lys Gly Val Glu  
915 920 925

cat gca ctg aat gtt atg gcg aca gag gca ggt ttc agc gat atg aat  
2832



His Ala Leu Asn Val Met Ala Thr Glu Ala Gly Phe Ser Asp Met Asn

930

935

940

att att acc cta tca gga aat tac tgt acg gat aag aaa cct tca gct  
2880

Ile Ile Thr Leu Ser Gly Asn Tyr Cys Thr Asp Lys Lys Pro Ser Ala

945

950

955

960

ttg aat tgg atc gat gga cgg ggc aag ggc att gtg gcc gaa gcc atc  
2928

Leu Asn Trp Ile Asp Gly Arg Gly Lys Gly Ile Val Ala Glu Ala Ile

965

970

975

ata ccg gcg aac gtt gtc agg gat gtc tta aag agc gat gtg gat agc  
2976

Ile Pro Ala Asn Val Val Arg Asp Val Leu Lys Ser Asp Val Asp Ser

980

985

990

atg gtt cag ctc aac ata tcg aaa aat ctg att ggg tcc gct atg gct  
3024

Met Val Gln Leu Asn Ile Ser Lys Asn Leu Ile Gly Ser Ala Met Ala

995

1000

1005

ggc tca gtt ggc ggc ttc aac gcc caa gct gcc aat ctt gcg gca  
3069

Gly Ser Val Gly Gly Phe Asn Ala Gln Ala Ala Asn Leu Ala Ala

1010

1015

1020

gcc att ttc att gcc aca ggt cag gat ccg gcg caa gtt gtg gag  
3114

Ala Ile Phe Ile Ala Thr Gly Gln Asp Pro Ala Gln Val Val Glu

1025

1030

1035

agc gct aac tgc atc act ctc atg aac aat ctt cgc gga tcg ctt  
3159

Ser Ala Asn Cys Ile Thr Leu Met Asn Asn Leu Arg Gly Ser Leu



1040	1045	1050
caa atc 3204	tct gtc tcc atg ccg	tct att gag gtt gga acg ttg ggc
Gln Ile	Ser Val Ser Met Pro	Ser Ile Glu Val Gly Thr Leu Gly
1055	1060	1065
ggt ggt 3249	acg att ctg gag ccc	cag ggc gca atg ctt gac atg ctt
Gly Gly	Thr Ile Leu Glu Pro	Gln Gly Ala Met Leu Asp Met Leu
1070	1075	1080
ggt gtc 3294	cgc gga tca cac ccg	acc act ccc ggt gag aat gca cgt
Gly Val	Arg Gly Ser His Pro	Thr Thr Pro Gly Glu Asn Ala Arg
1085	1090	1095
caa ctt 3339	gcg cgc atc atc gga	agc gct gtt ttg gct ggg gag ctc
Gln Leu	Ala Arg Ile Ile Gly	Ser Ala Val Leu Ala Gly Glu Leu
1100	1105	1110
tcg cta 3384	tgt gct gcc cta gcc	gcc ggt cac ctg gtc aag gcg cac
Ser Leu	Cys Ala Ala Leu Ala	Ala Gly His Leu Val Lys Ala His
1115	1120	1125
atg gcg 3429	cac aac cgt tct gcc	ccg gca tct tca gcc cct tct cga
Met Ala	His Asn Arg Ser Ala	Pro Ala Ser Ser Ala Pro Ser Arg
1130	1135	1140
agt gtc 3474	tcc ccg tca ggc gga	acc agg aca gtc cct gtt cct aac
Ser Val	Ser Pro Ser Gly Gly	Thr Arg Thr Val Pro Val Pro Asn



1145

1150

1155

aat gca ctg agg ccg agt gct gca gct act gat cgg gct cga cgc  
3519

Asn Ala Leu Arg Pro Ser Ala Ala Ala Thr Asp Arg Ala Arg Arg

1160

1165

1170

tga  
3522

&lt;210&gt; 50

&lt;211&gt; 1173

&lt;212&gt; PRT

&lt;213&gt; Penicillium citrinum

&lt;400&gt; 50

Met Val Ala Ser Leu Leu Pro Ser Arg Phe Arg Gly Arg Glu Ser Met  
1 5 10 15

Asn Gln Gln His Pro Leu Arg Ser Gly Asn Arg Ala Leu Thr Ser Thr  
20 25 30

Leu Gln Phe Leu Ser Lys Thr Ala Cys Leu His Pro Ile His Thr Val  
35 40 45

Cys Thr Ile Ala Ile Leu Ala Ser Thr Thr Tyr Val Gly Leu Leu Lys  
50 55 60

Asp Ser Phe Phe His Gly Pro Ala Asn Val Asp Lys Ala Glu Trp Gly  
65 70 75 80

Ser Leu Val Glu Gly Ser Arg Ser Leu Ile Thr Gly Pro Gln Asn Gly  
85 90 95



Trp Lys Trp Gln Ser Phe Asp Gly Asp Ala Asp Val Leu Gly Asp Phe  
100 105 110

Asn His Gln Ala Leu Met Thr Leu Val Phe Pro Gly Ser Tyr Gly Val  
115 120 125

Ala Ser Gln Ala Ala Ser Pro Phe Leu Ala Pro Leu Pro Val Asn Leu  
130 135 140

Ser Val Ile Asp Leu Pro Ser Thr Ser Ser Pro Leu Thr Ala Tyr Ser  
145 150 155 160

Lys Asp Lys Val Phe Ala Phe Ser Val Glu Tyr Ser Ser Ala Pro Glu  
165 170 175

Leu Val Ala Ala Val Gln Glu Ile Pro Asn Asn Ser Ala Asp Leu Lys  
180 185 190

Leu Gln Glu Thr Gln Leu Ile Glu Met Glu Arg Gln Met Trp Ile Met  
195 200 205

Lys Ala Ala Arg Ala His Thr Lys Arg Ser Leu Ala Gln Trp Val His  
210 215 220

Asp Thr Trp Thr Glu Ser Leu Asp Leu Ile Lys Ser Ala Gln Thr Leu  
225 230 235 240

Asp Val Val Val Met Val Leu Gly Tyr Ile Ser Met His Leu Thr Phe  
245 250 255

Val Ser Leu Phe Leu Ser Met Lys Lys Leu Gly Ser Lys Val Trp Leu  
260 265 270

Ala Thr Ser Val Leu Leu Ser Ser Thr Phe Ala Phe Leu Leu Gly Leu  
275 280 285

Asp Val Ala Ile Arg Leu Gly Val Pro Met Ser Met Arg Leu Leu Ser  
290 295 300



Glu Gly Leu Pro Phe Leu Val Val Ile Val Gly Phe Glu Lys Ser Ile  
305 310 315 320

Thr Leu Thr Arg Ala Val Leu Ser Tyr Ala Val Gln His Arg Lys Pro  
325 330 335

Gln Lys Ile Gln Ser Asp Gln Gly Ser Val Thr Ala Ile Ala Glu Ser  
340 345 350

Thr Ile Asn Tyr Ala Val Arg Ser Ala Ile Arg Glu Lys Gly Tyr Asn  
355 360 365

Ile Val Cys His Tyr Val Val Glu Ile Leu Leu Leu Val Ile Gly Ala  
370 375 380

Val Leu Gly Ile Gln Gly Gly Leu Gln His Phe Cys Val Leu Ala Ala  
385 390 395 400

Leu Ile Leu Phe Phe Asp Cys Leu Leu Leu Phe Thr Phe Tyr Thr Ala  
405 410 415

Ile Leu Ser Ile Lys Leu Glu Val Asn Arg Leu Lys Arg His Ile Asn  
420 425 430

Met Arg Tyr Ala Leu Glu Asp Glu Gly Leu Ser Gln Arg Thr Ala Glu  
435 440 445

Ser Val Ala Thr Ser Asn Asp Ala Gln Asp Ser Ala Arg Thr Tyr Leu  
450 455 460

Phe Gly Asn Asp Met Lys Gly Ser Ser Val Pro Lys Phe Lys Phe Trp  
465 470 475 480

Met Val Val Gly Phe Leu Ile Val Asn Leu Val Asn Ile Gly Ser Thr  
485 490 495

Leu Phe Gln Ala Ser Ser Ser Gly Ser Leu Ser Ser Ile Ser Ser Trp



500							505					510			
Thr	Glu	Ser	Leu	Ser	Gly	Ser	Ala	Ile	Lys	Pro	Pro	Leu	Glu	Pro	Phe
		515					520					525			
Lys	Val	Ala	Gly	Ser	Gly	Leu	Asp	Glu	Leu	Leu	Phe	Gln	Ala	Arg	Gly
	530					535					540				
Arg	Gly	Gln	Ser	Thr	Met	Val	Thr	Val	Leu	Ala	Pro	Ile	Lys	Tyr	Glu
545					550					555					560
Leu	Glu	Tyr	Pro	Ser	Ile	His	Arg	Gly	Thr	Ser	Gln	Leu	His	Glu	Tyr
				565					570					575	
Gly	Val	Gly	Gly	Lys	Met	Val	Gly	Ser	Leu	Leu	Thr	Ser	Leu	Glu	Asp
			580					585					590		
Pro	Val	Leu	Ser	Lys	Trp	Val	Phe	Val	Ala	Leu	Ala	Leu	Ser	Val	Ala
		595					600					605			
Leu	Asn	Ser	Tyr	Leu	Phe	Lys	Ala	Ala	Arg	Leu	Gly	Ile	Lys	Asp	Pro
	610					615					620				
Asn	Leu	Pro	Ser	His	Pro	Val	Asp	Pro	Val	Glu	Leu	Asp	Gln	Ala	Glu
625					630					635					640
Ser	Phe	Asn	Ala	Ala	Gln	Asn	Gln	Thr	Pro	Gln	Ile	Gln	Ser	Ser	Leu
				645					650					655	
Gln	Ala	Pro	Gln	Thr	Arg	Val	Phe	Thr	Pro	Thr	Thr	Thr	Asp	Ser	Asp
			660					665					670		
Ser	Asp	Ala	Ser	Leu	Val	Leu	Ile	Lys	Ala	Ser	Leu	Lys	Val	Thr	Lys
		675					680					685			
Arg	Ala	Glu	Gly	Lys	Thr	Ala	Thr	Ser	Glu	Leu	Pro	Val	Ser	Arg	Thr
	690					695					700				



Gln Ile Glu Leu Asp Asn Leu Leu Lys Gln Asn Thr Ile Ser Glu Leu  
705 710 715 720

Asn Asp Glu Asp Val Val Ala Leu Ser Leu Arg Gly Lys Val Pro Gly  
725 730 735

Tyr Ala Leu Glu Lys Ser Leu Lys Asp Cys Thr Arg Ala Val Lys Val  
740 745 750

Arg Arg Ser Ile Ile Ser Arg Thr Pro Ala Thr Ala Glu Leu Thr Ser  
755 760 765

Met Leu Glu His Ser Lys Leu Pro Tyr Glu Asn Tyr Ala Trp Glu Arg  
770 775 780

Val Leu Gly Ala Cys Cys Glu Asn Val Ile Gly Tyr Met Pro Val Pro  
785 790 795 800

Val Gly Val Ala Gly Pro Ile Val Ile Asp Gly Lys Ser Tyr Phe Ile  
805 810 815

Pro Met Ala Thr Thr Glu Gly Val Leu Val Ala Ser Ala Ser Arg Gly  
820 825 830

Ser Lys Ala Ile Asn Leu Gly Gly Gly Ala Val Thr Val Leu Thr Gly  
835 840 845

Asp Gly Met Thr Arg Gly Pro Cys Val Lys Phe Asp Val Leu Glu Arg  
850 855 860

Ala Gly Ala Ala Lys Ile Trp Leu Asp Ser Asp Val Gly Gln Thr Val  
865 870 875 880

Met Lys Glu Ala Phe Asn Ser Thr Ser Arg Phe Ala Arg Leu Gln Ser  
885 890 895

Met Arg Thr Thr Ile Ala Gly Thr His Leu Tyr Ile Arg Phe Lys Thr  
900 905 910



Thr Thr Gly Asp Ala Met Gly Met Asn Met Ile Ser Lys Gly Val Glu  
915 920 925

His Ala Leu Asn Val Met Ala Thr Glu Ala Gly Phe Ser Asp Met Asn  
930 935 940

Ile Ile Thr Leu Ser Gly Asn Tyr Cys Thr Asp Lys Lys Pro Ser Ala  
945 950 955 960

Leu Asn Trp Ile Asp Gly Arg Gly Lys Gly Ile Val Ala Glu Ala Ile  
965 970 975

Ile Pro Ala Asn Val Val Arg Asp Val Leu Lys Ser Asp Val Asp Ser  
980 985 990

Met Val Gln Leu Asn Ile Ser Lys Asn Leu Ile Gly Ser Ala Met Ala  
995 1000 1005

Gly Ser Val Gly Gly Phe Asn Ala Gln Ala Ala Asn Leu Ala Ala  
1010 1015 1020

Ala Ile Phe Ile Ala Thr Gly Gln Asp Pro Ala Gln Val Val Glu  
1025 1030 1035

Ser Ala Asn Cys Ile Thr Leu Met Asn Asn Leu Arg Gly Ser Leu  
1040 1045 1050

Gln Ile Ser Val Ser Met Pro Ser Ile Glu Val Gly Thr Leu Gly  
1055 1060 1065

Gly Gly Thr Ile Leu Glu Pro Gln Gly Ala Met Leu Asp Met Leu  
1070 1075 1080

Gly Val Arg Gly Ser His Pro Thr Thr Pro Gly Glu Asn Ala Arg  
1085 1090 1095

Gln Leu Ala Arg Ile Ile Gly Ser Ala Val Leu Ala Gly Glu Leu



1100	1105	1110
Ser Leu Cys Ala Ala Leu Ala	Ala Gly His Leu Val	Lys Ala His
1115	1120	1125
Met Ala His Asn Arg Ser Ala	Pro Ala Ser Ser Ala	Pro Ser Arg
1130	1135	1140
Ser Val Ser Pro Ser Gly Gly	Thr Arg Thr Val Pro	Val Pro Asn
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<400> 53

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20

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<400> 62

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20